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Murphy Watershed

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Watershed Analysis

▸ A Portion of the Lower Applegate Fifth Field Watershed ◂
(REO #1710030906)

U.S. Department of the Interior
Bureau of Land Management
Medford District Office
Grants Pass Resource Area

February 2000
Version 1.0

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WATERSHED ANALYSIS

(Portion of the Lower Applegate Fifth Field Watershed #1710030906)

U.S. Department of the Interior
Bureau of Land Management
Medford District
Grants Pass Resource Area

February 2000

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Dear Reader:

The purpose of this watershed analysis is to identify the various ecosystem components in the Murphy Watershed portion of the Lower Applegate fifth field watershed and their interactions at a landscape scale. The analysis looks at historical ecological components, current ecological components and trends. It makes recommendations for future management actions that could be implemented to reach recommended ecological conditions.

The Murphy Watershed that is being analyzed in this document is comprised of three of the five sixth field watersheds that make up the Lower Applegate fifth field watershed (REO watershed #1710030906). The Cheney-Slate Watershed Analysis addressed the other two. It was prepared in July 1996 prior to the final delineation of the REO's fifth field watersheds. The Murphy Watershed Analysis thus complements the Cheney-Slate analysis. It is anticipated that these two documents will be merged with the next iteration of the watershed analysis.

As you read this document, it is important to keep in mind that the watershed analysis process is an iterative process. As new information becomes available it will be included and updating will occur. It is also important to keep in mind that **this analysis document is not a decision document**. The recommendations that are included are a point of departure for project- specific planning and evaluation work. Some of the recommendations may conflict or contradict other recommendations. Project planning, which includes the preparation of environmental assessments and formal decision records as required by the National Environmental Policy Act (NEPA), will take these conflicts into consideration. Project planning and land management actions would also be designed to meet the objectives and directives of the Medford District Resource Management Plan (RMP).

This watershed analysis will thus be used as a tool in land management planning and project implementation within the Murphy / Lower Applegate Watersheds on Bureau of Land Management (BLM) administered lands. Although ecological information, discussions and recommendations are presented at the landscape scale largely irrespective of administrative ownership, please understand that the BLM will only be implementing management actions on the lands it administers.

Preparation of this watershed analysis follows the format outlined in the draft federal watershed analysis guidelines in the document entitled *RIEC 1995, Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis (Version 2.2).*

If you have additional resource or social information that would contribute to our better understanding the ecological and social processes within the watershed, we would appreciate hearing about them.

Robert C. Korfhage
Field Manager
Grants Pass Resource Area

TABLE OF CONTENTS

INTRODUCTION 1

I. CHARACTERIZATION 3
- A. PURPOSE 3
- B. INTRODUCTION 3
- C. CLIMATE 3
- D. OWNERSHIP 4
- E. REGULATORY CONSIDERATIONS 5
- F. EROSION PROCESSES 5
- G. HYDROLOGY 6
- H. WATER QUALITY 6
- I. STREAM CHANNEL 7
- J. VEGETATION 7
- K. SPECIES AND HABITATS 8
  - 1. Terrestrial 8
    - a. Special Status Plants 8
    - b. Wildlife 8
  - 2. Aquatic 9
  - 3. Fluvial Streams 9
- L. FIRE 10
  - 1. Background 10
  - 2. Fire Disturbance 10
  - 3. Fire Risk 11
- M. HUMAN USES 11

II. KEY ISSUES 13
- A. RURAL INTERFACE 14
- B. FUELS AND FIRE 15
- C. SOUTH ASPECT LATE-SUCCESSIONAL FOREST SUSTAINABILITY 15
- D. ROAD DENSITY 16
- E. ROAD DISTRIBUTION / ADMINISTRATIVE ACCESS 16
- F. WATER QUALITY 17
- G. FIRE EXCLUSION 17
- H. IRON CREEK ACEC 17
- I. NOXIOUS WEEDS 17
- J. KEY ISSUE - SMALL DIAMETER HIGH-DENSITY STANDS 17
- K. LATE-SUCCESSIONAL RESERVE / CRITICAL HABITAT 18
- L. CONNECTIVITY AND DISPERSAL 18

III. CURRENT CONDITION 19
- A. PURPOSE 19
- B. CLIMATE 19

C. SOILS 19
  1. Erosion Processes 19
    a. Concentrated Flow 20
    b. Streambank Erosion 20
    c. Mass Movement or Mass Wasting 21
  2. Road Densities 21
D. HYDROLOGY 22
E. WATER QUALITY 23
  1. Water Temperature 24
  2. Stream Flow 25
    a. Peak Flow 25
    b. Low Flow 26
  3. Domestic Water 26
F. STREAM CHANNEL 26
G. VEGETATION 28
  1. Major Plant Series 28
  2. Landscape Patterns 31
H. SPECIES AND HABITATS 33
  1. Introduction 33
  2. Terrestrial 34
    a. Botanical 34
    b. Wildlife 36
  3. Aquatic Habitats and Species 51
    a. General 51
    b. Stream Habitat Conditions 51
    c. Large Woody Material 53
    d. Macro-Invertebrates 53
    e. Special Status Species 54
    f. Salmonid Distribution 54
    g. Fish Passage Barriers 56
I. FIRE MANAGEMENT 57
  1. Fundamental Changes to the Natural Fire Regime 57
  2. Fuel Hazard, Wildfire Ignition Risk, Values at Risk 57
    a. Fuel Hazard 58
    b. Wildfire Ignition Risk 58
    c. Values at Risk 58
    d. Areas of High Hazard, Risk, and Value at Risk 59
J. HUMAN USE 59
  1. Socioeconomic Overview 59
  2. Recreation 60
    a. Dispersed Recreation 60
  3. Roads 60
  4. Minerals and Mining 61
    a. Minerals 61

        b. Surface Uses of a Mining Claim 63
        c. Mineral Potential 63
        d. Physical Condition Resulting from Past Mining Activities 63
    5. Cultural Resources 63
    6. Lands / Realty 64
    7. Illegal Dumping 64

IV. REFERENCE CONDITION 65
  A. PURPOSE 65
  B. CLIMATE 65
  C. EROSION PROCESSES 65
  D. HYDROLOGY 66
    1. Floods 66
    2. Droughts 67
    3. Dams 67
    4. Mining Effects 67
  E. STREAM CHANNEL 68
  F. WATER QUALITY 68
  G. VEGETATION 68
  H. SPECIES AND HABITATS 70
    1. Terrestrial 70
        a. Special Status Plants 70
        b. Wildlife 71
        c. Riparian 72
    2. Aquatic 73
        a. Fisheries 73
  I. FIRE 75
    1. Social Concern - Air Quality 75
    2. Social Concern - Hazardous Fuels Buildup 76
  J. HUMAN USES 76
    1. Cultural / Historical Use 76
    2. Roads 78
    3. Recreation 78

V. SYNTHESIS AND INTERPRETATION 79
  A. PURPOSE 79
  B. EROSIONAL PROCESSES 79
  C. HYDROLOGY 80
  D. WATER QUALITY 80
  E. STREAM CHANNELS 81
  F. VEGETATION 81
    1. Late-Successional Reserve 84
  G. SPECIES AND HABITATS 85
    1. Terrestrial Species and Habitats 85

a. Special Status and Survey and Manage Plants ... 85
b. Wildlife ... 86
2. Aquatic Species and Habitats ... 93
a. Stream and Riparian Trends ... 93
b. Riparian Reserves and Coarse Woody Material ... 93
c. Instream - Large Woody Debris ... 94
d. Sedimentation ... 94
e. Stream Flow ... 94
f. Stream Temperature ... 95
g. Aquatic Species ... 95
H. FIRE MANAGEMENT ... 95
I. HUMAN USE ... 96

VI. MANAGEMENT RECOMMENDATIONS ... 97
A. PURPOSE ... 97
B. RECOMMENDATIONS ... 97
C. DATA GAPS ... 97

TECHNICAL REFERENCES CITED ... 107

TABLES

Table I - 1: Land Ownership in the Murphy Watershed ... 4
Table I - 2: Land Status - Land Allocations on BLM-Administered Lands ... 4
Table II - 1: Key Issues ... 13
Table III - 1: Stream Orders ... 22
Table III - 2: Oregon DEQ's 303(d) Listed Streams in the Murphy Watershed ... 24
Table III - 3: Rosgen Stream Classification ... 27
Table III - 4: Rosgen Management Interpretations of Various Stream Types ... 28
Table III - 5: Major Plant Series (1997 ... 30
Table III - 6: Vegetation Condition Class (1997 ... 31
Table III - 7: Special Status / Survey and Manage Plants - Murphy Watershed ... 36
Table III - 8: Murphy Watershed - Potential Special Status Species (Vertebrates) ... 41
Table III - 9: Murphy Watershed - Potential Special Status Species (Invertebrates) ... 43
Table III - 10: Survey and Manage Species & Buffer Species in the Murphy Watershed ... 44
Table III - 11: Survey and Manage Mollusc Species ... 44
Table III - 12: Acres of McKelvey Rating Classes ... 46
Table III - 13: Neotropical Birds Potential in the Murphy Watershed ... 48
Table III - 14: Class I - IV Stream Habitat Conditions ... 52
Table III - 15: Oregon Department of Fish and Wildlife Habitat Benchmarks ... 52
Table III - 16: Special Status and Federally-Listed Aquatic Species ... 54
Table III - 17: Salmonid Distribution Within the Murphy Watershed ... 55
Table III - 18: Hazard Classification ... 58
Table III - 19: Risk Classification ... 58

Table III - 20: Values at Risk Classification 59
Table III - 21: Areas of High Rating in Hazard, Risk, and Values at Risk Classification 59
Table III - 22: Summary of Road Mileage by Surface Type 61
Table IV - 1: Historic Major Plant Series within Murphy Watershed - Circa 1920 69
Table IV - 2: Murphy Creek Flow and Temperature Data 74
Table V - 1: Expected Federal Habitat Trends for Species of Concern 87
Table VI - 1: Recommendations - All Land Allocations 97
Table VI - 2: Recommendations - Non-Reserve Allocations 100
Table VI - 3: Recommendations - LSR 102
Table VI - 4: Recommendations - Special Areas 103
Table VI - 5: Recommendations - Riparian Reserves 103
Table VI - 6: Data Gaps 105
Table C - 1: Murphy Watershed Road Information 132
Table D - 1: Suitable Habitat Available for Northern Spotted Owls Sites 135
Table D - 2: Special Status Species Habitat Needs 136

APPENDICES

Appendix A: Maps 110
Appendix B: Mining Claim Information 128
Appendix C: Road Information 129
Appendix D: Wildlife Information 135
Appendix E: Fire Management Planning 139

MAPS

Map 1: General Location of the Murphy Watershed 111
Map 2: BLM Land Use Allocations in the Murphy Watershed 112
Map 3: Dominant Vegetation in the Murphy Watershed 113
Map 4: Seral Stages on BLM Lands in the Murphy Watershed 114
Map 5: Plant Series in the Murphy Watershed 115
Map 6: Vegetation Condition Class in the Murphy Watershed 116
Map 7: Spotted Owl Habitat Rating (McKelvey) in the Murphy Watershed 117
Map 8: Stream Orders (>2) in the Murphy Watershed 118
Map 9: Approximate Distribution of Coho and Chinook Salmonids in the Murphy Watershed . 119
Map 10: Approximate Distribution of Steelhead and Cutthroat in the Murphy Watershed 120
Map 11: Mineral Potential in the Murphy Watershed 121
Map 12: Fire Hazard Rating in the Murphy Watershed 122
Map 13: Fire Risk Rating in the Murphy Watershed 123
Map 14: Fuel Models in the Murphy Watershed 124
Map 15: Fire Value Rating in the Murphy Watershed 125
Map 16: Areas of High Hazard, Risk and Value-at-Risk Ratings in the Murphy Watershed . . . 126
Map 17: TCP in the Murphy Watershed 127

INTRODUCTION

Preparation of watershed analyses is a key part of the implementation of the 1994 Northwest Forest Plan (NFP). It is primarily conducted at a fifth field watershed scale. It is a procedure with the purpose of developing and documenting a scientifically-based understanding of the ecological structure and the functions, processes and interactions occurring within a watershed. It is one of the principal analyses used to meet the ecosystem management objectives of the NFP's Standards and Guidelines. It is an analytical process, ***not*** a decision-making process. A watershed analysis serves as a basis for developing project-specific proposals and identifying the monitoring and restoration needs of a watershed. Watershed analysis is designed to be a systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives.

This watershed analysis will thus document the past and current conditions of the Murphy Watershed, both physically and biologically. It will interpret the data, establish trends, and make recommendations on managing this watershed toward the desired future condition.

The first part of this analysis will address the core physical, biological and human factors that characterize the watershed and their important ecological functions. Regulatory constraints that influence resource management in the watershed will also be identified. From these, key issues will be identified that will focus the analysis on the important functions of the ecosystem that are most relevant to the management questions, human values or resource conditions affecting the watershed.

Next, current and reference conditions of these important ecosystem functions will be described. How and why ecological conditions and processes have changed over time will be discussed during the synthesis portion of the analysis.

The final portion of the analysis identifies some recommendations for the Murphy Watershed taking into account land management constraints and the demand for the watershed's resources. These recommendations will guide the management of the watershed's resources toward the desired future condition.

Two key management documents are frequently referred to throughout this analysis. These are:

1. The Record of Decision for Amendments to U.S. Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl and its Attachment A, entitled the Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (April 13, 1994) (NFP);

2. The Final EIS and Record of Decision for the Medford District Resource Management Plan (June 1995) (RMP).

Murphy Watershed Analysis Interdisciplinary Team Members

The following resource professionals were members of the watershed analysis team and prepared the current document:

Tom Dierkes -- Vegetation

Janet Kelly -- Vegetation

Matt Craddock -- Cultural / Minerals

Dennis Glover – GIS

John Moore -- Aquatic Habitat / Fisheries

Jeanne Klein -- Recreation

Jim Roper -- Roads / Quarries

Dave Maurer -- Soil / Water and Team Lead

Linda Mazzu -- Botanical, Special Status Plants

John McGlothlin -- Proofreading

Tom Murphy -- Fuels and Fire

Kip Wright -- Terrestrial Wildlife and Habitats

I. CHARACTERIZATION

A. PURPOSE

The purposes of this section are: to identify the dominant physical, biological and human processes and factors in the watershed that affect ecosystem function or condition; to relate these features and processes to those occurring in the Applegate River basin or province; to provide the context for identifying elements that need to be addressed in the analysis; and to identify, map and describe the land allocations, the forest plan objectives and the regulatory constraints that influence resource management in the watershed, *RIEC 1995, Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis (Version 2.2).*

B. INTRODUCTION

The Murphy Watershed is located within the Klamath Mountain Physiographic Province of southwestern Oregon. It is in Josephine County, approximately three miles south of the city of Grants Pass (see Map 1 in Appendix A). This watershed makes up a lower portion of the Applegate Watershed and is a part of the designated Lower Applegate fifth field watershed.

Approximately 14 million years ago this area began uplifting and has been subsequently shaped by water into a mountainous terrain with a narrow valley floor. The surface ranges in elevation from 1,000 to approximately 5,200 feet. It has nearly 380 miles of waterways (136 miles of first order streams), including the Applegate River. Approximately 27% of these waterways provide habitat for salmonids. The watershed's soil formed from Klamath Province metavolcanic, metasedimentary and small amounts of granitic ultramafic rocks. The soil supports diverse forest vegetative types. The forests supply wood, recreation, and special products for human purposes while providing habitats for many species of terrestrial and aquatic wildlife and plants. People have settled and developed the toe slopes of the mountains and the valley floors.

C. CLIMATE

The Murphy Watershed has a Mediterranean climate with cool, wet winters and warm, dry summers. Average annual precipitation in the watershed ranges from approximately 26 inches in the northern portion to 60 inches in the far southwest portion. The Sexton Summit weather station is located about 14 miles to the north of the watershed boundary within the Jumpoff Joe Watershed at an elevation of 3,836 feet. Temperatures recorded at Sexton Summit show the lowest average monthly minimum occurs in January (30.5° F). The highest average monthly maximum temperature occurs in July (75.1° F). This may correlate with temperatures at high elevations within the Murphy Watershed. Temperatures recorded at the Grants Pass weather station show the lowest monthly minimum average occurs in January (32.3° F). The highest average monthly maximum in Grants Pass occurs in July (89.8° F). This correlates with temperatures at lower elevations within the Murphy Watershed.

D. OWNERSHIP

The Murphy Watershed Analysis addresses all lands within the 41,663 acre Murphy Watershed. Table I-1 notes the general land ownership distribution within the watershed.

Table I - 1: Land Ownership in the Murphy Watershed

Land Ownership / Administration	Acres	Percent of Total
BLM	17,380	42%
Private	24,283	58%
Watershed Total	**41,663**	

Map 2 (Appendix A) shows the location of BLM-administered land in the watershed.

The Northwest Forest Plan (NFP) and the Medford District's Resource Management Plan (RMP) made a variety of land use allocations as a framework within which federal land management objectives vary. Together, they are designed to meet the broader objectives of the regional plans. Table I-2 summarizes these allocations as they occur within the Murphy Watershed. Map 2 (Appendix A) shows the location of the different land allocations.

Table I - 2: Land Status - Land Allocations on BLM-Administered Lands

Land Use Allocation	BLM Acreage	% of BLM in Watershed	Comments
AMA not in LSR	9,521	54.8%	
Late-Successional Reserves in the AMA	7,818	45.0%	
Riparian Reserves	--	--	Acreage included in other allocations
Administratively Withdrawn Area	44	0.3%	Provolt seed orchard
Special Area in LSR	286	1.6%	Iron Creek ACEC
TOTAL - BLM	**17,380**		

The Murphy Watershed is a "non-key watershed." It is located within the Applegate Adaptive Management Area (AMA).

Riparian reserves border all the streams on federal land in the watershed. These areas are a critical part of the NFP's Aquatic Conservation Strategy to restore and maintain the ecological health of watersheds and aquatic ecosystems. The main purposes of the reserves are to protect the health of the aquatic system and its dependent species and to provide benefits to upland species. These reserves help maintain and restore riparian structures and functions, benefit fish and riparian-dependent nonfish species, enhance habitats for organisms dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for terrestrial and aquatic animals and plants, and provide for greater connectivity of late-successional forest habitat (NFP, p.7).

E. REGULATORY CONSIDERATIONS

Important federal laws pertinent to management of BLM lands in the watershed include the Clean Water Act (CWA), National Environmental Policy Act (NEPA), Federal Land Policy and Management Act (FLPMA), the National Historic Preservation Act (NHPA), the Endangered Species Act (ESA), and the Oregon and California Lands Act (O&C Act).

F. EROSION PROCESSES

The dominant erosion processes occurring in this watershed are concentrated flow erosion (sheet / rill erosion and gully erosion), stream channel erosion and mass wasting. Erosional processes within the landscape are driven by gravity and the influence of water (precipitation and runoff) on soil shear strength. Other factors that have influenced the erosional processes on the landscape are climate, vegetation and fire. Water erosion is important as it not only detaches soil particles (and sometimes earthen material), but also transports the material downhill.

Concentrated flow erosion is a concern on hill slopes where most of the vegetation has been removed and where roads have concentrated runoff in unconsolidated ditches and diverted it to areas where surface protection is inadequate. Soil erosion occurs when soil particles are detached by raindrop splash or the overland flow of water and moved to another location on the landscape. Eroded soil particles can move from less than an inch to many miles depending on the topography and vegetative cover. This erosion is of concern because it can reduce the productivity of the land and increase sediment in local waterways.

Channel erosion occurs as large volumes of water and debris rush through the waterways dislodging soil particles from the streambanks and transporting them downstream. This type of erosion is important as it can widen a stream channel, which may cause the stream to spread and become shallower. Also, the detached soil sediments may deposit in fish spawning gravel or rearing pools, reducing habitat effectiveness. High road densities may activate this type of erosion because of the increased peak flows that are caused (see Road Density section below). Deep, fine-textured soils that occur at the base of upland areas on fans, footslopes and terraces are most susceptible to channel erosion.

Mass movement processes in the Murphy Watershed occur in different forms: raveling on steep slopes, soil creep, earthflows, slumps and debris slides. These phenomena occur on different portions of the landscape and under differing conditions but most involve water-saturated soil moving downhill. This type of erosion is important as many tons of soil may be lost on the hillside. The soil moving downhill eventually reaches a stream or waterway and can have detrimental affects. Soils that commonly occur in the watershed are deep fine texture. These soils are indicative of mass movement potential.

These erosional processes, combined with the uplifting of the landscape that has been occurring for the last 14 million years, are primarily responsible for the morphological characteristics of the watershed. As the landscape was uplifted, belts of varying rock types were exposed to weathering. The uplifting process occurred faster than the erosional process which has resulted in deeply incised stream canyons (draws) with high gradients (Rosgen Aa+) in most of the watershed and in alluviated valley streams with low to moderate gradients and entrenched channels (Rosgen B and F). Riparian areas along these streams provide habitats for plants and animals associated with the aquatic resources. Many of the riparian areas of the streams in the watershed have been disturbed as a result of timber harvest, road construction or fire.

Road density is the measurement of total road length for a given area, commonly expressed as miles of road per square mile. The Murphy Watershed has highly variable road densities. Road densities in excess of four miles per square mile are considered high and will have detrimental cumulative effects on stream water quality and quantity. Two areas with high road density are upper Murphy Creek and Onion Creek. Road density and future road development are a concern, generally because roads intercept surface water and shallow groundwater and route it to natural drainageways. This concentrates and increases natural runoff and may cause erosion. It may bring sediment to the stream system. Peak stream flows may increase compared to stream flows in areas with few or no roads. Increased peak flows may increase streambank erosion.

G. HYDROLOGY

There are approximately 370 miles of streams in the Murphy Watershed in addition to the Applegate River. The headwaters of these streams are generally steep and fast flowing. Small streams north of the Applegate River are particularly subject to low or intermittent flows due to the south aspect and low precipitation.

The stream flow in the Murphy Watershed fluctuates with the seasonal variation in rainfall. Peak flow events occur during high-intensity storm events of long duration, usually in the winter and early spring. The flows of the Applegate River in this watershed are heavily affected by storm events, snow melt and flow control from the Applegate Dam. There are no stream gauges in this watershed. The Applegate River floods of December 22, 1964 and January 15, 1974 were higher than the highest recorded discharge (December 22, 1955) of 66,500 cubic feet per second near Wilderville. The maximum recorded discharge after flow regulation of the Applegate by the Applegate Dam was 44,000 cfs on January 2, 1997.

H. WATER QUALITY

Water quality varies throughout the Murphy Watershed. The Applegate River and Caris Creek are the only streams in the watershed that have been identified as water quality-limited under various criteria. Nonpoint water pollution has been identified as moderate to severe in these two streams. The types of water quality and pollution are detailed in Chapter III, Current Condition. Observation and some data indicate that many other streams in the watershed warrant examination for water quality limitations, particularly in areas of high summer temperatures and fine sediment.

I. STREAM CHANNEL

The major streams in the watershed can be classified into one of four stream types based on the Rosgen system of stream classification: A, B, C or F. Type A are steep entrenched, cascading, step / pool streams with high energy transport associated with depositional soils and are very stable if bedrock or boulder dominated. Type B are moderately entrenched and have a moderate gradient with a riffle-dominated channel and with infrequently-spaced pools. They have a very stable plan and profile with stable banks. Type C are moderately meandering with floodplains on one or both sides of the channel. Type F are entrenched, meandering and have a riffle / pool channel on low gradients with high width to depth ratios.

J. VEGETATION

The Murphy Watershed is dominated by mixed conifer and mixed conifer / hardwood forests. Vegetative conditions across the landscape are highly variable. These conditions developed as a result of geologic conditions, climatic conditions, periodic disturbance and human influence. They are characterized by high fire frequencies both historically and, to a lesser extent, in the present. Fire exclusion has resulted in significant increases instream density (more stems per acre), shifts in species composition (*e.g.*, increases in fire-intolerant, shade-tolerant species) and changes in stand structure. These transformations have increased the forests' susceptibility to large, high-severity fires and to epidemic attack by insects and disease.

Plant communities in the Murphy Watershed have been affected by more direct human influences as well. Mining, logging, agriculture, road building and residential development have reduced the acres of late-successional forest within the watershed while increasing the acres in early seral stages.

The Murphy Watershed contains four major plant series: white oak, Jeffrey pine, ponderosa pine and Douglas-fir. Plant communities (associations) with the same climax dominant(s) are referred to as plant series. The Jeffrey pine series, for example, consists of associations in which Jeffrey pine is the climax dominant (Atzet and Wheeler 1984). The Douglas-fir / pine grouping is a mix of Douglas-fir and ponderosa pine. There is not enough data to distinguish which species is climax.

The Applegate River flows through the Murphy Watershed. Vegetation along the river is classified as a grouping of riparian and hardwood vegetative types. The Applegate River bisects and delineates the opposing north-south portions of the watershed which have very different forest structures, species composition, and age distributions. The valley floor extends southeast to northwest and is an area where agriculture, grazing, and rural home sites are the dominant uses.

The south to southwest portion of the watershed is dominated by the Douglas-fir series. As one moves down in elevation the Douglas-fir / pine grouping increases in dominance. In the northern half of the watershed and along the northern perimeter of the valley floor, the ponderosa pine series is dominant. The northern half of the watershed has a southern exposure where drier sites and more drought tolerant species occur and the frequency of fire disturbance is greater. The white oak series occurs in the northeastern portion of the watershed. This series occupies southern slopes and drier sites within Douglas-fir / ponderosa pine stands.

K. SPECIES AND HABITATS

1. Terrestrial

a. Special Status Plants

Approximately 30% of BLM lands in the Murphy Watershed have been surveyed to date: 53% of the AMA lands and 5% of the late-successional reserve (LSR) lands. To date, lands have been surveyed exclusively for the following timber projects: North Murphy, Scattered Apples, hazard tree and miscellaneous special forest product sales.

Twenty-two populations of Survey and Manage vascular plants have been located. The majority are *Cypripedium fasciculatum* populations, but *Allotropa virgata* and *C. montanum* have also been located. One Bureau Sensitive species has been located: *Pellea mucranata var. mucranata.* This rare fern location is the only known population in the state of Oregon. The species is on List 2 (taxa that are threatened with extirpation or presumed to be extirpated from Oregon) under the Oregon Natural Heritage Program. Another *Pellea* species was found in the watershed in one location. This could also be a rare fern, but the species has not been identified yet. Several Bureau Assessment, Bureau Tracking and Bureau Watch species have also been found in the Murphy Watershed including *Lotus stipularis var. stipularis*, *Lithophragma heterophylla, Smilax californica* and *Perideridia howellii.* These species are designated List 2 and List 3. (Specific species for which more information is needed before a status can be determined) under the Oregon Natural Heritage Program.

The majority of Survey and Manage plant locations found to date have been located in the North Murphy project area in the Douglas-fir / pine series. *Cypripedium* species tend to be found in the limited moist microsites of riparian areas between drier plant associations.

b. Wildlife

The northern spotted owl (*Strix occidentalis caurina*) and the American bald eagle are the only known ESA listed species in the Murphy Watershed. A portion of the watershed has been designated as critical habitat for the northern spotted owl by the U.S. Fish and Wildlife Service (USFWS). In addition, the southwest part of the watershed is designated as a late-successional reserve. There are eleven northern spotted owl centers of activity in the watershed.

Key processes for wildlife include dispersal and migration of wildlife within and through the watershed. These processes are highly-dependent on quality, quantity and spatial distribution of appropriate habitat through time. Species habitat requirements vary greatly and a single dominant vegetative structure will not meet the needs of all species. Migration can occur at a localized level or at regional level. Species migrating through the watershed on a regional level include animals as diverse as insects, bats and birds. Localized migration allows for species to take advantage of foraging opportunities and cover during inclement conditions. Localized dispersal of species is critical for ensuring gene flow and repopulation of uncolonized habitat.

The diversity of soil types vegetative communities and habitats in the Murphy Watershed provides for the potential of a diversity of sensitive animal species. There is potential habitat for 46 vertebrate special status species (15 mammals, 19 birds, and 12 reptiles and amphibians). In addition, a diversity of Survey and Manage invertebrate species may occur in the vicinity (see Chapter III, Current Condition for a complete list of sensitive species). Relatively few formal surveys of wildlife have actually been conducted in the watershed. Distribution, abundance and presence of the majority of the species is unknown. Other vertebrates of concern include cavity nesting species, band-tailed pigeons and neotropical migrant birds. Twenty-one special status species are associated with older forest, eight with riparian, and eight with special habitats such as caves, cliffs and talus. The remaining species are associated with habitats such as oak stands, meadows and pine savannahs (see Chapter V, Synthesis and Interpretation, for habitat trends). The NFP has identified additional Survey and Manage wildlife species that probably occur in the watershed (see Chapter III, Current Condition).

2. Aquatic

Factors such as stream temperature, number and depth of pools, large woody material, stream meander, road / stream crossings and sedimentation are key to the survival of salmonids and to fish productivity. Rearing salmonids require a water temperature of 58°F for optimum survival condition. Stream temperature is dependent upon riparian area temperature and is influenced by heat sinks such as nearby roads and open meadows.

3. Fluvial Streams

Most fluvial streams in the Rogue River Basin meet ODFW benchmark standards for numbers of pools. Pools provide depth for hiding cover and volume for rearing habitat. The goal for adequate pool-to- riffle ratio is 40:60 or 30:70, depending on the geomorpholgy of the watershed.

Cutthroat trout, steelhead, coho and chinook salmon are found in the Murphy Watershed. Each is a cold water species and requires a complex habitat, especially in its early life stages. Quantitative abundance estimates are absent. Professional observations indicates a low abundance of coho and low to moderate abundance for cutthroat trout, steelhead and chinook. Coho salmon can be considered an indicator species for the health of an aquatic ecosystem. Cutthroat and steelhead typically have a wider range of distribution and are found higher in the tributaries than coho and chinook. Factors limiting salmonid production include: inadequate stream flows in the summer months; high water temperatures; erosion and sedimentation; lack of large woody material in the stream and riparian area; lack of rearing and holding pools for juveniles and adults, respectively; channelization of streams in the canyons and lowlands; and blockages of migration corridors.

The mainstem of the Applegate River flows through the Murphy Watershed. Anadromous fish such as the Pacific lamprey, salmonids including summer and winter steelhead), cutthroat trout, fall and spring chinook and coho salmon use the Applegate River for migration. Fall chinook spawn throughout the Applegate River up to the Applegate Dam.

L. FIRE

1. Background

Fire regimes of the Pacific northwest vary in response to the vegetation growth environment (temperature and moisture patterns), ignition pattern (lightning, human,) and plant species characteristics (fuel accumulation, adaptations to fire). Effects of forest fires can be more precisely described by grouping effects by fire regimes. Agee (1981) describes three broad fire regime categories (these can and often do overlap considerably with one another):

> *High-severity regimes*: Fires are very infrequent (more than 100 years between fires) and are usually high-intensity, stand-replacement fires.
>
> *Moderate-severity regime*: Fires are infrequent (25-100 years) and are partial stand-replacement fires, including significant areas of high and low severity.
>
> *Low-severity regime*: Fires are frequent (1-25 years) and are low-intensity fires with few overstory effects.

Fire regimes are the manifestation of the biological, physical, climatic and human components of an ecosystem as reflected in the type, frequency and size of fires (Pyne 1982). This is a relationship that perpetuates itself in a circular and stable pattern. The biotic components are an expression of the fire regime which, in turn, maintain the pattern and occurrence of fire. However, when any components of the ecosystem are modified, the fire regime is prone to change.

The persistence of certain species in southwestern Oregon through the millennia can be attributed to their adaptations to fire (Kauffman 1990). Adaptations for fire survival are adaptations to a particular ecosystem and its specific fire regime. If the regime is altered, the capacity for that species to survive in the environment may be greatly changed.

2. Fire Disturbance

Fire has been identified as the key natural disturbance within the Applegate River Watershed *(Applegate Adaptive Management Area Ecosystem Health Assessment, 1994)*of which Murphy is a subwatershed. The Murphy Watershed has historically experienced a low-severity fire regime. Low-severity fire regimes are associated with frequent fires of low intensity. Fire frequency in the watershed would be similar to the larger Applegate River Watershed, which is estimated to have been 7-20 years at the elevations below 3,500 feet (*Applegate Adaptive Management Area Guide, 1998*). Approximately 90% of the Murphy Watershed is below 3,500 feet elevation. In a low-severity fire regime most of the dominant trees are adapted to resist low-intensity fire. They develop thick bark at a young age. This limits overstory mortality and most of the fire effects occur on small trees in the understory. Fires in a low-severity regime are associated with ecosystem stability, as the system is more stable in the presence of fire than in its absence (Agee 1990). Frequent, low- severity fires keep sites open so that they are less likely to burn intensely even in severe fire weather conditions.

With the advent of fire exclusion and suppression, the pattern of frequent, low-intensity fire ended. Dead and down fuel and understory vegetation are no longer periodically removed. This creates a trend of ever increasing amounts of available fuels. The longer interval between fire occurrence creates higher intensity, stand-replacement fires rather than the historic low-intensity stand maintenance fires.

It is important to recognize that each vegetative type is adapted to its particular fire regime (Agee 1981). The significance of this is that the historic vegetative types that existed prior to Euro-American settlement cannot be maintained in the present fire regime that has resulted from fire exclusion.

3. Fire Risk

Human actions greatly influence the pattern of fire occurrence and the number of fires in the watershed. The watershed as a whole has a high level of risk of human-caused ignition. Human uses which create ignition risk include residential, industrial (light manufacturing, timber harvest, mining / quarry operations), recreational, tourist and travel activities. Human use within the watershed is high. The human-caused fire occurrence pattern for the watershed would generally be a fire starting at low elevations or along roads and burning up to the uppermost ridgetops.

Lightning occurrence in the watershed has been moderate to high. The watershed typically experiences at least one lightning storm event every two to three summers. Multiple fire starts often result from these storms. Most of these fire starts occur on the mid to upper slopes. Fire spread is mainly to the ridge and back down the opposite side, with slower backing downslope spread.

The potential for a large fire is high to extremely high for this watershed. This is due to the buildup of fuels, both live and dead, overstocking of conifers and hardwoods, and the presence of less fire-resistant species, these have invaded in the absence of frequent fire occurrence and due to past management practices that created, but did not treat, slash.

M. HUMAN USES

The land ownership pattern of the Murphy Watershed was molded in the late 1800's and early 1900's. The lands in the watershed in the mid 1800's were public lands owned by the United States and administered by the General Land Office. The first large-scale transfer of public lands from federal ownership was to the state of Oregon following statehood in 1859.

In order to further develop the west, Congress passed several laws enabling settlers to develop and obtain ownership of the public lands. These included Donation Land Claim patents, entry under the Homestead Acts, military patents and mineral patents. In addition to these types of deeds, land was deeded to the Oregon and California Railroad (O&C), with some of those lands being sold to private individuals. In reviewing the master title plats for the Murphy Watershed, it is apparent that ownership of several of the low-elevation lands were originally deeded from the United States to private individuals through the above acts of Congress.

Current human use of the watershed includes dispersed recreation, timber production and harvesting, mining, and agriculture. Recreational use of the area is dispersed and includes off-highway vehicle (OHV) use, hunting, mountain biking and horseback riding. There are currently many non-designated trails and foot paths in the area.

II. KEY ISSUES

INTRODUCTION

The purpose of this section is to focus the analysis on the key elements of the ecosystem that are most relevant to the management questions, human values, or resource conditions within the watershed (Federal Guide for Watershed Analysis, Version 2.2, 1995).

Key issues are identified in order to focus the analysis on the unique elements of the watershed. Key issues are addressed throughout the watershed analysis process within the context of the related core questions. The key issues identified are summarized in Table II-1. A short narrative which discusses the relevance of each key issue in the watershed follows this table. The issues are not presented in any order of relative importance.

Table II - 1: Key Issues

Key Issues	Related Core Topic
A. The watershed encompasses a large rural interface area and a great deal of private property.	Human Uses, Hydrology, Vegetation, Fire, Erosion Process, Species and Habitats
B. Fuel / Fire - The extensive rural interface area and heavy recreational use creates a potential high risk of fire occurrence. There is a high potential for large-scale, high-intensity stand-replacement fire due to existing vegetation density-and-fuels buildup.	Fire, Vegetation, Erosion Processes, Water Quality, Species and Habitat
C. Late-successional forest and habitat located on south and west aspects may not be sustainable over time due to their fire susceptibility. Late-successional forest habitat on northerly aspects has a higher chance for longevity.	Vegetation, Species and Habitats, Fire, Human Use
D. Road density - Roads affect natural drainage and alter stream flow in some instances. Road density is high in much of the watershed, particularly on non-BLM land. Pressure to build roads for private access is the primary reason for an upward trend in road density.	Human Uses, Hydrology, Erosion Processes, Species and Habitats
E. Road distribution / access - Road distribution is extremely varied with a broad range of road densities in subwatersheds. This creates difficulties for fire management and wildfire suppression. Administrative access to BLM lands is limited.	Human Uses, Hydrology, Erosion Processes, Species and Habitats
F. Water Quality - Many streams in the watershed naturally have warm temperatures in the summer. Development activities have compounded the water quality problem by, for example, diverting water flows from stream channels and exposing stream water to solar radiation.	Water Quality, Human Uses, Hydrology, Stream Channel, Erosion Processes, Species and Habitats
G. Fire exclusion has affected the diversity and resiliency of vegetation by shifting species composition to later seral, less fire-tolerant species.	Fire, Vegetation, Human Uses
H. Iron Creek Area of Critical Environmental Concern	Human Uses
I. Noxious Weeds - Native grassland communities have been heavily invaded by non-native species.	Vegetation, Species and Habitats

Table II - 1: Key Issues

Key Issues	Related Core Topic
J. Small Diameter High-Density Stands - The watershed includes areas with many high-density stands where the tree sizes are in the lower range of merchantability. While needing density reduction to maintain / enhance stand growth and vigor, the commercial value of these trees is low, precluding economical harvest with most conventional logging methods, contract types and existing markets. BLM's Special Forest Products (SFP) program has also experienced increasing demand for specialty items such as manzanita products, herbs and mushrooms.	Vegetation, Fire, Human Uses
K. Late-Successional Reserve / Critical Habitat	Species and Habitats
L. Late-successional forest connectivity is fragmented in the watershed	Species and Habitats

A. RURAL INTERFACE

The Rural Interface Area (RIA) has the potential of being a critical element affecting future management of the ecosystem within the watershed. Increased urbanization historically has been extremely influential in altering physical, biological and human processes. Federal ownership and land management direction retains 42% of the watershed in natural resource management land use. Development is most common near cities and towns. However, relatively rapid increases have occurred on privately owned non-commercial forest lands. These lands are typically in valley bottoms in the numerous subdrainages located throughout the Murphy Watershed. These lands have increasingly been subdivided into smaller size parcels allowing population densities to increase.

Human population growth in valley habitat has fragmented habitat important to the existence of some special status plant species. The valley habitat in the Murphy Watershed has been developed as is true in most of the Rogue Valley. This development continues to spread into foothill oak woodland habitat. This alters the wildlife. Domestic water use may also be lowering the water table indirectly affecting wetland plant diversity. Off-road vehicle use and illegal dumping could be disturbing individual populations and introducing exotic species.

Human population growth may potentially affect sensitive plant and animal populations through displacement of individuals, eradicating populations and alteration of habitats. Replacing natural vegetation with urban or agricultural development reduces diversity and introduces exotic species. Increased urban growth further stresses aquatic systems which are already suffering from over-appropriation. Stresses include decreased water quality, reduction instreamside vegetation, increased water temperatures and unnaturally high levels of sedimentation from urban runoff.

The rural interface issue may affect management of the human uses in the watershed. The following sub-issues were identified relating to human uses:

> *Unauthorized uses* - There is a higher potential for unauthorized uses of public lands when they are within the rural interface. These uses include dumping, theft of forest products, off-

road vehicle use which may damage natural resources, and vandalism of government property.

Recreation - Recreational opportunities exist on the public lands within the rural interface areas adjacent to the watershed. There is a demand for recreational use of these areas.

Adjacent public lands - As the population of the rural interface increases the management of the public lands will be more strongly affected. This influence may be reflected in the development of the future land use plans for the public lands.

Encroachment - With the increase in population adjacent to the public lands within the watershed, there is an increased chance of encroachment onto those public lands. This encroachment may include the need for access across, or special use of, BLM-managed lands for adjacent private land owner needs.

Road density - Because of the expanding growth of the urban area, the high-density of roads on private lands will continue to increase the overall road density within the watershed.

B. FUELS AND FIRE

There is a high level of risk for a large-scale, high-severity wildfire within the watershed. Mixed land ownership, rural interface area, and heavy recreational use increase the complexity of fire prevention, protection, fuels management, and hazard reduction programs.

Fire exclusion has created vegetative and fuel conditions with high potential for large, destructive, and difficult-to-suppress wildfire occurrence. The watershed has a large number of sites which are at a high risk of loss from wildfire. High-severity, stand-replacement wildfire presents a threat to human life, property, and nearly all resource values within the watershed. Management activities can reduce the potential for stand-replacement type fires through hazard reduction treatments. Public acceptance of hazard reduction management activities will be critical for the long-term health and stability of the forest ecosystem within the watershed.

C. SOUTH ASPECT LATE-SUCCESSIONAL FOREST SUSTAINABILITY

The current stand density and forest structure conditions i.e., those that meet the standards for late-successional habitat condition) may not have been widespread or have even existed on these aspects in previous centuries. They could have occurred only during infrequent periods when there were long intervals between wildfire events.

Growing conditions in the twentieth century have been more favorable than in recent centuries due to generally warmer and wetter climate then. This coupled with successful fire exclusion has created vegetative and fuel conditions which are, at best, at the extreme range of natural conditions.

Current vegetative conditions produce a high susceptibility to stand-replacement wildfire on south aspects. The stand density and forest structure conditions that produce late-successional habitat condition create high-density, multilayered canopies, greater dead and down fuel loading, and fewer fire-resistant species. These are all conditions conducive to high-intensity, stand-replacement fire occurrence.

Long-term maintenance of late-successional forest habitat conditions on these sites could prove to be a challenge. It will require intensive and costly fuels management treatments. Treatments will need to balance the vegetative and structural conditions of late-successional habitat with fuel conditions that do not create high-intensity, stand-replacement fire. It may prove impossible to perpetuate these habitats over long time periods.

D. ROAD DENSITY

Roads are a main contributor to altered peak and low stream flows. Roads interrupt surface and shallow groundwater and route the flow through the road drainage system. This can be a direct route to the natural stream system. Intermediate peak flows are consequently higher than natural ones and low flows can occur earlier in the summer season than would be the case under natural conditions. Road location, design prism, and drainage system are variables that can affect the flow. In the case of the Murphy Watershed road densities are generally high on non-BLM land (greater than four miles per square mile) and moderate on BLM land (approximately two miles per square mile). There are localized areas where road density is higher on BLM land.

Road density can relate to soil erosion, water quality and quantity issues. Improperly designed roads concentrate surface and shallow groundwater and route it to natural drainageways changing their classification and increasing soil movement. High road densities can also have numerous adverse impacts on fish and wildlife. Unmanaged roads may lead to increased vehicular / human disturbances, facilitate poaching and fragment areas of habitat.

Excessive sedimentation of streams is another factor in decreased water quality. The high road densities in the Murphy Watershed, especially on private land, contribute to this. During the wet season, the roads catch the rain runoff and transport the sediment into the streams. Salmon and steelhead eggs are in the spawning gravels at this time and can be buried under the newly-deposited silt. This sediment prevents oxygen from reaching the eggs, and as a result they suffocate and die. The headwaters of Murphy Creek have an especially high road density which contributes to the sedimentation in Murphy Creek.

E. ROAD DISTRIBUTION / ADMINISTRATIVE ACCESS TO BLM LANDS

Legal access to the BLM lands within the watershed is currently limited in the lower elevations due to the large amount of private lands at those locations. Although there may be physical access available, there are few easements or rights that have been acquired allowing long-term public or administrative access by the BLM to those lands.

F. WATER QUALITY

Water quality is a limiting factor to salmon and trout populations within the Murphy Creek watershed. There are several factors which have contributed to the poor water quality of many streams. The numerous irrigation diversions of the Applegate River tributaries have altered the natural hydrologic patterns of many of these streams. Reduced summer flows are a natural aspect of the stream flow regime. However, irrigation diversions compound the problem by causing stream flows to recede earlier in the season. The reduced stream flows are more prone to overheating. As a result, summer rearing habitat for fish is significantly reduced.

The mainstem of the Applegate River exceeds the Oregon Department of Environmental Quality's (ODEQ) seven-day average maximum water quality standard. Murphy Creek has exceeded this standard in 1997 and 1998.

G. FIRE EXCLUSION

Fire exclusion has allowed the growth and buildup of vegetation and fuel conditions that are at or beyond the extreme range of natural conditions. Many areas will experience total or near total stand replacement when wildfire occurs. Density-and-fuels reduction treatments will be necessary to create conditions which will reduce the potential for a stand-replacement fire.

H. IRON CREEK ACEC

The Iron Creek ACEC (286 acres) was designated in the 1995 Medford District RMP. The purpose for designation was to preserve low-elevation old-growth forest habitat.

I. NOXIOUS WEEDS

The low- to mid-elevation dry grasslands of the Murphy Watershed have been invaded heavily by non-native grasses and forbs. The AMA Ecosystem Health Assessment (1994) states: "More than 50% of the watershed acreage in this general community type is completely dominated by non-native species and the remainder is being converted." One of the most prevalent species is yellow star thistle.

J. KEY ISSUE - SMALL DIAMETER HIGH-DENSITY STANDS

The watershed includes areas with many high-density stands where the tree sizes are in the lower range of merchantability. Such stands need density reduction to maintain and enhance stand growth and vigor, but the commercial value of trees is low, precluding economical harvest using conventional logging methods and contract types in established markets.

Within the AMA there is strong local interest for developing strategies to use special forest products and resources to contribute to the economic base of the community. The current process for managing vegetative resources on BLM-administered land predominantly involves either commercial sales contracts or appropriation-based service contracts where the commercial product values are low or nonexistent. This constrains the potential options for effectively implementing landscape and ecosystem management goals such as returning the vegetative conditions to their natural range of variability in an efficient and timely manner.

K. LATE-SUCCESSIONAL RESERVE / CRITICAL HABITAT

A portion of the Murphy Watershed is designated as late-successional reserve and also as critical habitat for the northern spotted owl (see Map 2). The critical habitat was designated in 1992 by the U.S. Fish and Wildlife Service (USFWS) in order to facilitate the recovery of the species. The USFWS designated areas that would protect clusters of reproductively-capable spotted owls. Like critical habitat, the late-successional reserve system was developed around clusters of owls along with a consideration of the needs of other late-successional forest species. In general, critical habitat and late-successional reserve overlap in the Murphy Watershed. The USFWS accepted the late-successional reserve system of the NFP as the agencies' contribution to the recovery of the northern spotted owl.

Due to past management activities, particularly timber harvesting, a portion of the late-successional reserve is not functioning as late-successional forest habitat (see Current Conditions for more information on the LSR). A part of the late-successional reserve land allocation is not capable of producing late-successional forest suitable for spotted owl habitat due to natural conditions such as serpentine-derived soils. The late-successional forest habitat that currently exists on southerly aspects is vulnerable to stand-replacing fire and it might not be possible to maintain this habitat in the long term.

L. CONNECTIVITY AND DISPERSAL

Late-successional forest habitat includes old-growth and mature forest stands with high canopy closure (> 60%), large trees, snags, canopy layering and down logs. This type of habitat is not evenly distributed in the watershed. The majority of this habitat is located south of the Applegate River in the late-successional reserve. The northern portion of the watershed has very little late-successional habitat due to its hot, dry southerly aspect where it occurs. It is primarily restricted to riparian areas and some localized sites with more northerly aspects. Connectivity for late-successional forest species across the watershed and between the LSR and the watersheds to the north is poor and primarily limited to riparian reserve areas.

III. CURRENT CONDITION

A. PURPOSE

The purpose of this section is to develop detailed information relevant to the key issues identified above and to document the current range, distribution, and condition of the relevant ecosystem elements.

B. CLIMATE

The Murphy Watershed has a Mediterranean climate with cool, wet winters and warm, dry summers. Most of the precipitation is in the form of rain. About 10% of the watershed is above 3,000 feet in elevation in the transient snow zone (TSZ). The transient snow zone is where shallow snow packs accumulate and then melt throughout the winter in response to alternating cold and warm fronts (USDI-BLM 1993). Average annual precipitation in the Murphy Watershed ranges from approximately 24 to 60 inches. The least amount of rain falls in the north portion of the watershed. The greatest amount of precipitation falls in the far southwest portion of the watershed at the higher elevations (approximately 5,200 feet).

A National Oceanographic Atmospheric Administration (NOAA) weather station is located about 12 miles to the north of the Murphy north boundary on Sexton Summit within the Jumpoff Joe watershed at an elevation of 3,836 feet. Temperatures recorded at Sexton Summit show the lowest average monthly minimum occurs in January (30.5° F). The highest average monthly maximum temperature occurs in July (75.1° F). This correlates to temperatures at high elevations within the Murphy Watershed. Temperatures recorded at the Grants Pass NOAA weather station show that the lowest monthly minimum average occurs in January (32.3° F). The highest average monthly maximum in Grants Pass occurs in July at 89.8° F. These temperatures should be indicative of temperatures at lower elevations within the Murphy Watershed. The thirty-year average (1951 through 1980) rainfall at Sexton Mountain is 38.14 inches. The thirty-year average (1951-1980) rainfall at the Grants Pass weather station is 31.01 inches.

C. SOILS

1. Erosion Processes

Erosion hazard is an indication of a soil's susceptibility to particle or mass movement from its original location. Particle erosion hazard for concentrated water flow assumes a bare soil surface condition. If the soil is protected by vegetation, litter, or duff, such that no mineral soil is exposed, concentrated flow erosion is not likely to occur. Streambank erosion is a function of exposed use streambanks to peak stream flows. Mass movement erosion is a function of the mass strength of the soil mantle and underlying geologic material. Large plant root strength plays a roll in the susceptibility to mass movement. Most soil and highly-weathered rock is weakest at high moisture levels.

a. Concentrated Flow

The dominant erosion process is concentrated flow erosion. This form of erosion occurs when water accumulates on the soil surface, predominately where there is little or no protective organic material. As the water flows downslope it builds energy which allows for detachment of soil particles that then travel as sediment in the flowing water. Sediment is then deposited where flow rates diminish.

Areas that are particularly susceptible to concentrated flow erosion consist of soils of variable parent materials on steep slopes. The following general soil groups fall into this category: Vannoy-Manita-Voorhies, Josephine-Speaker-Pollard, Beekman-Vermisa-Colestine, Siskiyou, Pearsoll-Dubakella, Cornutt-Dubakella, and Jayar-Woodseye. Of these, the granitic Siskiyou soil is most erosive due to low cohesiveness and minimum levels of organic binders in the upper layer. Also of concern are the serpentine and serpentine-influenced soils: Pearsoll-Dubakella and Cornutt-Dubakella. These soils have a high magnesium content and low calcium. The resulting plant communities usually contain only a few species that grow slowly and are tolerant of this condition, arranged in a randomly scattered distribution. This results in thin duff and litter layers. These soils have surface textures ranging from gravelly sandy loam to cobbly clay loam. These soils have high erosion hazard due to the severity of the slope. The steep slopes give flowing water high erosive energy as it increases velocity running downslope.

Conditions that are most conducive to concentrated flow erosion include: road drainage outlets, unprotected road ditches, areas of bare soil usually created by ground disturbing activities or fire, wheel ruts on natural-surface roads, and highly-altered ground surface created by OHV's or other motorized equipment. Areas of high road density, which often have more intense ground disturbance than would naturally occur, are commonly prone to this type of erosion (see Road Density discussion below).

b. Streambank Erosion

Another process that may commonly occur in the watershed is streambank erosion. This is the loss of streambanks through sloughing, block failure or scouring by high stream flows. Two situations generally occur where streambank erosion may be evident.

In the first situation, streambank erosion occurs as a result of high peak stream flow combined with exposed deep, fine, and medium-textured soils that make up the streambanks where streams are Rosgen type A or B (see Stream Channel section below). The watershed experienced a 30 to 40 year storm event in January, 1997. This is an example of an event that would generate high peak stream flows that may have caused streambank erosion in the Murphy Watershed at sites where bank protection and root strength were limited. The following general soil groups are susceptible: Pollard-Abegg, Holland-Barron-Siskiyou and Vannoy-Manita-Voorhies.

In the second situation, streambank erosion occurs on larger streams as a result of extended peak stream flows where water level remains at or above bankfull levels for an extended time. This occurred during the same storm mentioned above on the Applegate River at the BLM's Provolt Nursery. The extensive period of high flow, five to six days (ref: phonecon with Lynette Gains, Provolt seed orchard), was a result of flow regulation at the Applegate Dam. A contributing factor was a dike upstream and on the opposite side of the river. Flow was forced or bounced from the dike side over to the Provolt side of the river. There was no flow relief that would have otherwise occurred had the river flooded on the dike side. The BLM is funding a project to fix the damage in the summer of 1999 at a cost of over $100,000. It should be recognized that this was a flood flow that without regulation would have exceeded the streambank levels and may have damaged the banks. Soils were of the common floodplain, alluvial type Camas gravelly sandy loam. Rounded cobbles are common in the remaining streambank.

c. Mass Movement or Mass Wasting

Colluvial movement of gravels is one common type of mass movement erosion found in this watershed. Colluvial movement is caused by the force of gravity on steep slopes. Talus moving down a mountain slope is a simple example of colluvial rock movement. The Vermisa part of the Beekman-Vermisa-Colestine and the Jayar part of the Jayar-Woodseye general soil groups commonly have patches of varying size of gravel called lag slopes. The gravel is commonly two to greater than six inches thick. Areas that commonly accumulate gravel include draw and swale bottoms and other depressions in steep landscape.

Other forms of mass movement that may occur in the watershed include debris flows, block slumps, and earthflows. These usually occur rapidly and during periods of deep saturation (*e.g.*, the latter half of winter and early spring). A debris flow is a moving mass of soil, rock, and plant material that moves relatively linearly downslope. They often remove all vegetation and scour the bottom to bedrock. This leaves a steep-sided draw with or without intermittent stream flow. Soils most susceptible to debris flow are the granitic Siskiyou. A block slump is a type of landslide that occurs on the side of a slope. A block or large mass of soil and weathered parent material moves downslope leaving a slip plane. This results in a bulge or bench on the slope with an over-steep headwall above it. Parts of the slump may continue to move in a series of episodes leaving a step appearance and several benches. Soils most susceptible to block slumps are Josephine, Manita, and Pollard where they occur on steep slopes. Earthflows are characterized by over-thickened clay-rich soils that, when saturated, will "ooze" slowly downslope. Soils most susceptible to earthflow are Dubakella, Manita, and Pollard.

2. Road Densities

Roads on sloping ground intercept surface water and shallow groundwater. The water is commonly routed by the road to a draw or other natural drainageway that is part of the natural stream system. This process causes drainage water to reach streams quicker than would naturally occur. The more roads that exist in a particular area, the more the increase of peak stream flow. With an increase of peak stream flow, streambanks are more susceptible to erosion as the stream channel adjusts to the change in flow pattern. Additional stream sediment caused by this phenomenon comes predominately from eroded streambanks. Other sources of stream sediment are the road surface, slough from steep road banks, and eroded channels created by flows at drainage outlets downslope.

The above gives a general perspective on high road densities. Road design and locations on the landscape, however, produce varying effects. For example, an outsloped road with waterdips, a rocked surface and outlet filters would produce fewer effects than a lower slope natural-surfaced road with ditches. This is because of differences in proximity to the stream system, degree of concentration / distribution of surface water flow due to road design, and differences in the amount of protection of the road surface. In order to understand the comprehensive nature of road effects in the Murphy Watershed, a full analysis of all subwatersheds is needed which considers road densities and existing road conditions, design and location on the landscape. This will be accomplished by evaluating each road in the transportation system via the BLM's Transportation Management Objectives (TMO) process.

Within the Murphy Watershed there is a great range of road densities from low (about 2 miles per square mile) to very high (over 6 miles per square mile). Generally, the higher road density areas are on non-BLM land. The areas with high to very high road densities include parts of the Murphy Creek, Onion Creek, Gray's Creek and Board Shanty Creek.

D. HYDROLOGY

There are approximately 380 miles of streams in Murphy Watershed (see Map 8).

Table III - 1: Stream Orders

Stream Order	1	2	3	4	5	6&7	8	Total
Miles	136	133	53	33	12	0	13	380
Percent of Total	36%	35%	14%	9%	3%	0%	3%	

Source: Medford BLM GIS

Stream orders are defined by how many streams come together to create a larger stream. A stream that is at the headwaters and has no tributaries is a first order stream. When two first order streams flow together at the point that they join, the stream becomes a second order stream, and so on.

First and second order streams in the watershed have a major influence on downstream water quality since they comprise approximately 71% of the total stream miles in the planning area. Beneficial uses by these streams include aquatic species and wildlife. Most first and second order streams in the watershed are characterized by intermittent and ephemeral stream flow. They are generally very narrow and V-shaped with steep gradients. Large woody debris, which dissipates stream energy and slows channel erosion, is a key component of these headwater streams. The amount of large woody debris in first and second order streams in the planning area has been reduced as a result of timber harvest and prescribed burning. This loss of woody debris contributes to reduced channel stability and increased sediment movement downstream during storm events (USDI-BLM 1994).

Third and fourth order streams comprise 23% of the stream miles in the watershed. Many of these streams support fish or directly contribute to the water quality of fish-bearing streams. Third and fourth order streams in the watershed are generally perennial, fairly narrow, have stream gradients of less than 5%, and have U-shaped channels. During winter storms, these streams can move large amounts of sediment, nutrients, and woody material. Channel condition of these streams varies and depends upon the inherent channel stability and past management practices. The amount of large woody debris contributed to these streams has been reduced by past management practices in the riparian areas (USDI-BLM 1994).

Fifth and eighth order streams make up roughly 6% of the stream miles in the planning area. These streams support fish and provide other beneficial uses. Fifth order and larger streams tend to be wider, have flatter gradients, with a noticeable floodplain. Flood events play a major role in the channel condition of these larger streams. Actions on adjacent upland areas and on non-BLM-administered land have adversely affected some of these stream segments (USDI-BLM 1994). The eighth order stream is the Applegate River. Inflow from the Applegate River upstream of this watershed has a dominant effect on this reach of the river.

Mature forest stands along all streams on BLM-administered land generally contain trees of sufficient size to provide a future source of large woody debris. However, past practices such as salvage logging from stream channels, leaving inadequate numbers of conifers in riparian areas, and removing debris jams to improve fish passage have reduced the amount of large woody debris in fifth order and larger streams (USDI-BLM 1994).

E. WATER QUALITY

Water quality varies throughout the Murphy Watershed. The Oregon Department of Water Quality (DEQ) has monitored or collected water quality data from various sources on the streams and water bodies of the state. This information is captured in DEQ's 1988 Oregon Statewide Assessment of Nonpoint Sources of Water Pollution, and has been periodically updated and compared to standards. This has led to listing of some streams as "water quality limited". The most recent stage of this process has been the publication for public review of Oregon's 1998 Section 303(d) Decision Matrix by the DEQ.

Table III-2 lists those streams in the Murphy Watershed currently listed as water quality limited. It is based on the DEQ's 1998 303(d) List Decision Matrix.

Table III - 2: Oregon DEQ's 303(d) Listed Streams in the Murphy Watershed

Stream & Segment	Parameter / Criterion	Basis for Consideration	Supporting Data or Info	Listing Status
Applegate River: Mouth to Applegate Dam	Flow Modification	IWR (ODFW); Flow Data(USGS,WRD)	Severely depressed populations of Coho	303(d)
	Sedimentation	NPS Assessment, data(DEQ, 1988)	None	Need Data
	Temperature (Fish Rearing, 64F)	USGS & BLM Data	USGS Exceeded Std. 79-153 days, 1990, 1991, 1992, 1993	303(d)
	Toxics	NPS Assessment, Data(DEQ, 1988)	None	Need Data

Streams that are 303(d) listed are water quality limited. They are required to be managed under Water Quality Management plans. Since the Applegate River is the mainstem stream in the Murphy Watershed, all streams that feed into the Applegate will be included in the Water Quality Management Plan. It does not appear that many of the streams in this watershed were included in the original inventory; no data has been collected. This includes Caris Creek, Onion Creek and Murphy Creek. These streams appear to be possible candidates for testing for temperature, sedimentation and flow modification. Streams with status of "Need Data" are candidates for water quality limited status but, due to insufficient data, a determination was not possible when the list was made. Future data collection may change their status.

1. Water Temperature

Many factors contribute to elevated stream temperatures in the Murphy Watershed. Low summer stream flows, hot summer air temperatures, low-gradient valley bottoms, the south aspects in the north of the Applegate, lack of riparian vegetation and high channel width-to-depth ratios result in stream temperatures that can stress aquatic life. Natural disturbances that can affect stream temperature are climate (high air temperatures), below-normal precipitation (low flows), wildfire (loss of riparian vegetation) and floods (loss of riparian vegetation). Human disturbances affecting stream temperatures include water withdrawals, channel alterations and removal of riparian vegetation through logging, mining, grazing or residential clearing (USDI-BLM 1997). Logging, mining, and residential clearing are the three forms of human disturbance that are most evident in this watershed. Some streams in natural (undisturbed) condition may have temperatures that exceed DEQ standards due to lack of vegetation for shade, particularly in rocky, serpentine areas, and very warm summer temperatures in this watershed.

The DEQ has established that the seven (7) day moving average of the daily maximum shall not exceed the following values unless specifically allowed under a Department-approved basin surface water temperature management plan:

- 64° F
- 55° F during times and in waters that support salmon spawning, egg incubation and fry emergence from the egg and from the gravels.

2. Stream Flow

Stream flow in tributary streams fluctuates with the seasonal variation in precipitation. The Applegate River also fluctuates due to water releases from the Applegate Dam and inflow from tributaries between the Murphy Watershed and Applegate Dam.

a. Peak Flow

Maximum peak flows generally occur in December, January and February. No data is available for the watershed. The maximum discharge at the gauge site (1.8 miles southeast of the town of Applegate) since the filling of Applegate Lake was 29,700 cubic feet per second on January 1, 1997.

Upland disturbances can result in increased magnitude and frequency of peak flows which may result in accelerated streambank erosion, scouring and deposition of stream beds, and increased sediment transport. The natural disturbance having the greatest potential to increase the size and frequency of peak flows is a severe, extensive wildfire.

In the Murphy Watershed, the primary human disturbances that can potentially affect the timing and magnitude of peak flows include roads, soil compaction (due to logging and agriculture) and vegetation removal (forest product harvest and conversion of sites to agricultural use). Quantification of these effects on stream flow in the watershed is not available. Roads quickly intercept and route subsurface water and surface water to streams. The road-altered hydrologic network may increase the magnitude of increased flows and alter the timing of when runoff enters a stream (causing increased peak flows and reduced low flows). This effect is more pronounced in areas with high road densities and where roads are in close proximity to streams (USDI-BLM 1997).

Soil compaction resulting from skid roads, agriculture and grazing also affects the hydrologic efficiency within a watershed by reducing the infiltration rate and causing more rainfall to quickly become surface runoff instead of moving slowly through the soil to stream channels (USDI-BLM 1997).

Vegetation removal reduces water interception and transpiration and allows more precipitation to reach the soil surface and drain into streams or become groundwater. Until the crown closures reach previous levels, a site is considered to be hydrologically unrecovered. Rates of hydrologic recovery are site-specific and depend on many factors, including the type and extent of disturbance, soils, climate, and rates of revegetation (USDI-BLM 1993). Extensive removal of vegetation in the transient snow zone are of particular concern due to alterations of the stream flow regime and resultant increased peak flow magnitudes (USDI-BLM 1997).

The transient snow zone (TSZ) is the zone in which rain on snow events commonly occur. This is a moderate-elevation range (3,000 to 4,500 feet) that is between the common snow level and where rain is the usual form of precipitation. In the Murphy Watershed the TSZ covers roughly 10% of the total area. This indicates that runoff from rain on snow in openings is not significant enough to create excessive runoff and thus high stream flows at the fifth field watershed level. This is because the area of openings does not appear to be large in relation to the subwatershed area. However, much of the TSZ is located in the Murphy Creek subwatershed where interpretive maps indicate substantial areas of saplings and nonvegetated land. This may be having an appreciable effect on runoff and stream flow within the Murphy Creek system.

No hydrologic cumulative effects analysis (extent of equivalent clear cut area, compacted area, TSZ, and road density by subwatershed) has been performed for the Murphy Watershed.

b. Low Flow

Low summer flows in the Murphy Watershed reflect the low summer rainfall. Naturally low summer flows are exacerbated for tributaries to the Rogue River by periods of below-normal rainfall. Low flow of the Applegate River is augmented through releases to the Applegate River from Applegate Lake. The lowest flow since filling of Applegate Lake was 65 cubic feet per second at a gauge site 1.8 miles southeast of the town of Applegate (USGS Water Data Report OR-97-1). The greatest need for water occurs during the summer months when demand for irrigation and recreational use is highest (Lindell 1997).

There is no known quantitative information about stream flows for the Applegate River or its tributaries within the Murphy Watershed.

3. Domestic Water

There is little information available about domestic water use in the watershed. Wells are the predominant source for drinking water in this rural watershed. There are no groundwater studies for this area because use of groundwater is limited. Water quality and quantity is variable. Quantity varies also due to the nature of the bedrock and limited fracturing that would allow occurrence of aquifers.

F. STREAM CHANNEL

A system of stream classification has been developed by Rosgen that is useful in assessing various types of streams as to their sensitivity to disturbance and their recovery potential. Table III-3 provides a description of the classifications for the type of streams common in the watershed. The classifications are symbolized by a combination of letters and numbers. The first letter represents the stream type, the number represents the channel material.

Table III - 3: Rosgen Stream Classification

Stream Type	General Description	Landform / Soils / Features
Aa+	Very steep, deeply entrenched, debris transport, torrent streams.	Very high relief. Erosional, bedrock or depositional features; debris flow potential. Deeply entrenched streams. Vertical steps with deep scour pools; waterfalls.
A	Steep entrenched, cascading, step / pool streams. High energy / debris transport associated with depositional soils. Very stable if bedrock or boulder dominated.	High relief. Erosional or depositional and bedrock forms. Entrenched and confined streams with cascading reaches. Frequently spaced, deep pools in associated step / pool bed morphology.
B	Moderately entrenched, moderate gradient, riffle dominated channel, with infrequently-spaced pools. Very stable plan and profile. Stable banks.	Moderate relief, colluvial deposition, or structural. Moderate entrenchment and width / depth ratio. Narrow, gently sloping valleys. Rapids predominate with scour pools.
C	Low-gradient, meandering, point-bar, riffle / pool, alluvial channels with broad, well defined floodplains.	Broad valleys with terraces, in association with floodplains, alluvial soils. Slightly entrenched with well-defined meandering channels. Riffle / pool bed morphology.
D	A braided condition with excessive bedloads. There is a high amount of surface water exposed to solar radiation. Depth is relatively shallow. Sections of Type D are not stable, usually due to excessive load of sediment created from an upstream source during high flows.	Broad valleys with terraces, in association with floodplains, alluvial soils. Slightly entrenched with well-defined meandering channels. Riffle / pool bed morphology.
F	Entrenched meandering riffle / pool channel on low gradients with high width / depth ratio.	Entrenched in highly-weathered material. Gentle gradients, with a high width / depth ratio. Meandering, laterally unstable with high bank erosion rates. Riffle / pool morphology.

Much of the Applegate River in the Murphy Watershed is stream type C. Some sections of the Applegate are stream type D.

Table III - 4: Rosgen Management Interpretations of Various Stream Types

Stream Type	Sensitivity to Disturbance	Recovery Potential	Sediment Supply	Streambank Erosion Potential	Vegetation Controlling Influence
A2	very low	excellent	very low	very low	negligible
A3	very high	very poor	very high	high	negligible
A4	extreme	very poor	very high	very high	negligible
B4	moderate	excellent	moderate	low	moderate
B5	moderate	excellent	moderate	moderate	moderate
B6	moderate	excellent	moderate	low	moderate
C3	moderate	good	moderate	moderate	very high
C4	very high	good	high	very high	very high
D4	very high	poor	very high	very high	moderate
F5	very high	poor	very high	very high	moderate

There is no stream survey information available for the tributaries to the Applegate River within the Murphy Watershed.

G. VEGETATION

Existing vegetative conditions are described and mapped based on features such as major plant series and existing condition class with respect to size and structure. Data used in this mapping was collected during the spring and summer of 1997.

1. Major Plant Series

The following plant series have been identified and mapped as the primary series within the Murphy Watershed:

Douglas-fir	(*Pseudotsuga menziesii* ((Mirb.) Franco.))
Jeffrey pine	(*Pinus jeffreyi* (Grev. & Balf.))
Ponderosa pine	(*Pinus ponderosa* (Laws.))
White oak	(*Quercus garryana* (Dougl.))

Table III - 5 summarizes the acreages of these of these series identified and mapped within the Murphy Watershed.

A plant series is an aggregation of plant associations with the same climax species dominants. It defines the potential natural vegetation that would exist on the site at the climax stage of plant succession or the end point of succession. The major plant series also tells us something about site productivity and site potential. Site productivity can be expressed in terms of basal area per acre. Basal area is defined as the area of the cross section of a tree stem near its base, generally at 4.5 feet above the ground and inclusive of bark. Basal area in a plant series is not limited to the tree species for which that series is named. For example, the basal area in the Douglas-fir series can be from Douglas-fir, madrone, sugar pine or any other tree species present on the site.

Douglas-fir is the most common tree species in southwestern Oregon. Douglas-fir series sites average 254 ft^2 /acre (Atzet and Wheeler 1984). Douglas-fir tends to produce conditions that favor fire wherever it occurs. This species is self-pruning, often sheds its needles and tends to increase the rate of fuel buildup and fuel drying (Atzet and Wheeler 1982). Due to the success of fire suppression efforts over the last 70 years, overall cover of this species has increased.

Forests in the ponderosa pine series average 170 ft^2 /acre of basal area. This series is relatively rare as ponderosa pine does not often play the role of a climax dominant (Atzet and Wheeler 1984). This series tends to occupy hot, dry aspects that burn frequently. Ponderosa pine regeneration is restricted by reducing the number of fire events. Due to the success of fire suppression over the last 70 years, overall cover of this species has decreased (Atzet and Wheeler 1982).

The Douglas-fir / pine grouping is a mix of Douglas-fir and ponderosa pine. There is not enough data to distinguish which species is climax.

The Jeffrey pine series is confined to areas of ultra basic (serpentine and serpentine influenced) areas (Atzet and Wheeler 1982). Serpentine areas dominated by Jeffrey pine may have the lowest productivity of any conifer series in the Klamath Province. The average basal area in this series is 83 $ft^{2/}$acre (Atzet and Wheeler 1984). While not considered important in terms of timber production, these sites are floristically diverse and support many special status plants. Minor inclusions of Jeffery pine are scattered throughout the southern portion of the Murphy Watershed. These areas also have value as unique habitats for a variety of wildlife species. The once frequent fires, every seven to twenty years, have bypassed the Jeffery pine series located in Case Creek of the LSR. Only low-impact disturbances (*e.g.*, mosaic underburn, understory thinning and brushing) that remove understory vegetation will shift the successional trajectory back to the understory reinitiation phases, which is necessary to perpetuate the native vegetation.

The white oak series occurs at low elevations and is characterized by shallow soils. Although Oregon white oak is usually considered a xeric species, it also commonly occurs in very moist locations such as floodplains, heavy clay soils and on river terraces. On better sites, white oak is out competed by species that grow faster and taller (Stein 1990). The average basal area of this series is 46 ft^2 /acre. Water deficits significantly limit survival and growth (Atzet and McCrimmon 1990). White oak has the ability to survive as a climax species as it is able to survive in environments with low annual or seasonal precipitation, droughty soils and where fire is a repeated natural occurrence (Stein 1990). Fire events in this series are typically high frequency and low intensity (Atzet and McCrimmon 1990). Due to the success of fire suppression over the last 70 years, the extent of this series has declined.

Table III - 5: Major Plant Series (1997)

Plant Series	BLM		Non-BLM		All Lands	
	Acres	%	Acres	%	Acres	%
Douglas-fir	7,703	44%	3,828	16%	11,531	28%
Ponderosa pine	3,476	20%	4,511	19%	7,987	19%
Douglas-fir / pine	3,699	21%	4,056	17%	7,755	19%
White oak	1,245	7%	383	2%	1,628	4%
Jeffrey pine	1,187	7%	27	0.1%	1,214	3%
Nonforest	70	0.4%	10,479	43%	10,549	25%
Riparian / Hardwood	0	0%	998	4%	998	2%
Totals	17,380		24,282		41,662	

Vegetation condition classes are presented in Table III - 6. This information was developed based on the majority condition class present within a BLM-delineated operational inventory (O.I.) unit. As mapped, these units range from very uniform to a highly variable mosaic. Minor inclusions of white oak, and shrub or grass / forb lands within an operational inventory unit are not expressed in the vegetation condition class table unless it is the majority vegetation class. Data from landsat imagery and field findings indicate that shrub and grass / forb acreage could be as much as 500 acres higher in the northern portion of the watershed. The non-vegetal classification refers to areas that do not fit into one of the recognized natural plant series classifications, such as farmland, pasture lands, orchards and rural developed areas. Old Growth is limited to riparian areas due to frequent fires and predominantly south aspects of the north half of the watershed. The south half of the watershed, in particular Spencer Creek area, has the greatest amount and greatest potential for old-growth stands.

Table III - 6: Vegetation Condition Class (1997)

Vegetation Condition Class	BLM		Non-BLM		All Lands	
	Acres	% of Ownership	Acres	% of Ownership	Acres	% of Ownership
Developed / Vegetated	61	0.4%	10,308	42%	10,369	25%
Developed / Nonvegetated	0	0%	171	1%	171	0.4%
Nonvegetated	0	0%	998	4%	998	2%
Grass / Forb	44	0.3%	0	0%	44	0.1%
Shrub	0	0%	0	0%	0	0%
Hardwood	1,828	11%	810	3%	2,638	6%
Early Seral	145	1%	26	0.1%	171	0.4%
Seedlings / Saplings	626	4%	0	0%	626	2%
Poles (5 to 11")	3,750	22%	4,829	20%	8,579	21%
Large Poles (11 to 21")	4,985	29%	7,104	29%	12,089	29%
Mature (+21")	5,941	34%	37	0.2%	5,978	14%
Totals	**17,380**		**24,283**		**41,663**	

2. Landscape Patterns

The Murphy Watershed's vegetation is predominately Douglas-fir, ponderosa pine and nonvegetated. The Douglas-fir series is found in the south to southwest and northeast portions of the watershed with the rest of the watershed having vegetation consistent with the hotter, dryer conditions. The midrange of this watershed is a continuation of the inland valley vegetation (ponderosa pine and non-forest). The riparian vegetation along the Applegate River is also included in this portion of the watershed and then it transitions into the Douglas-fir series with the increase of elevation on the more northerly aspects. Isolated areas of white-fir were found in the upper elevations of the southwestern portion of the watershed on the more mesic sites; however, not enough data is available to map the white-fir plant series.

Approximately 50% of the Murphy Watershed is densely-stocked pole stands. These stands have an average diameter between 5 and 11" DBH.

In the northern portion of the watershed mature forest is rare, and is located primarily in riparian reserves and in two areas of northern aspects. Most of the mature forest is located on BLM lands in the LSR. Mature forest covers approximately 15% of the watershed for all ownerships and 34% of BLM- administered lands. Only very small areas are characterized by old growth due to the nature of sites and the fire history. The potential for other than small areas of old growth is very low for the same reasons.

In the northern half of the watershed where southern exposures and drier climates predominate, plant communities in forest stands are representative of the Ponderosa pine or Douglas-fir series (Douglas-fir / Dwarf Oregon grape, Douglas-fir / poison oak associations). In the Douglas-fir series, the tree overstory is almost entirely Douglas-fir with scattered sugar pine and small patches of ponderosa pine. Ponderosa pine becomes more significant and transitions to a pine series on ridges and on the lower and warmer aspects. Pine generally is not present as regeneration in the understory because canopy density is too high. Pine / manzanita associations are present near meadows. Forested stands are often separated by ridgetop meadows or by areas with low-site productivity that can sustain only shrubs or oak woodlands. Within forest stands considered commercial sized, the principal hardwoods are madrone and black oak, with scattered bigleaf maple, dogwood, and willows. Madrone's abundance is dependent on fire history and a stand's seral stage. In the Douglas-fir series, madrone usually does not survive to become a significant component of the canopies of merchantable stands, but is significant in other vegetative series'. Madrone competes with the growth of young seedlings, but will be neutral to beneficial in securing conifer regeneration. Canyon live oak is present in shallow, rocky soils.

Predominant early seral vegetation includes grass species, hazel, poison oak and other herbs. Deerbrush and wedgeleaf ceanothus are usually present and are very aggressive and competitive if sites are burned or if the crown canopy is opened.

Both the northern and southern portions of the watershed have been intensively managed for timber production on both federal and private land under an even-aged silvicultural system. This system often combined clearcutting, and gross yarding with broadcast burning for site preparation. BLM units are presently stocked to Oregon State Forest Practices Act and BLM standards. Maintenance, brushing and release treatments in young stands continues. Most of the privately-owned land appears to be in early and mid-seral stages.

Stands are highly variable in density, canopy layers by size class, and species. There is a great degree of diversity and complexity within small areas. There is a relatively fine-grained mosaic of stands that contain Douglas-fir in the most productive areas, a conifer / hardwood mix on less productive sites, and areas of hardwood dominance where growth is limited due to shallow soils. Stands available for commercial harvest entry are multilayered. The older canopy is generally 80 to 160 years old. Occasionally, large old-growth trees, generally located in clumps, make up the upper canopy. Remaining large conifers that have escaped fires generally have a patchy distribution on southerly aspects, compared to northerly aspects which often have a more continuous canopy of larger coniferous trees.

Forest stands with the most timber volume are located on the cooler aspects and in the draws. The midstory condition is dense pole to mature size timber which occurs as solitary or interlocked patches. These patches usually are less than fifteen acres in size. Natural regeneration is present where natural gap formation has created openings or in areas with an overstory canopy cover of less than 60%. Understory trees tend to grow slowly in the northern half of the watershed unless the overstory basal area is below 100 ft^2 per acre and overstory crown canopy is less than 40%.

Low moisture regimes and drought conditions coupled with dense stands have created stress conditions over most of the northern half of the watershed. The largest concentrations of insect killed trees in the Grants Pass Resource Area is typically in the northern half of the watershed. Insect problem outbreaks are currently active and stands are at risk to insect attack due to stress conditions.

The recent lack of frequent natural disturbance and the effectiveness of fire suppression have enabled the conifer stands to retain high stocking levels. These high stocking levels are sufficient to cause suppression mortality or loss of tree vigor (reduced radial growth and live crown ratio). The ability of trees to respond to release is diminished and susceptibility to insect attack is increased. Old- growth Douglas-fir, sugar pine and ponderosa pine trees have been dying because of competition for water from excessively dense understory vegetation. Many of the forest stands also have a dense overstory with ladder fuels present in portions of the stand that create conditions for crown fires. This could result in large stand-replacement fires.

Douglas-fir is regenerating on sites which have historically been pine sites. It is shading out ponderosa pine on sites where pine is physiologically better adapted for the long term and the possible climatic warming and periodic fires. Manzanita and ceanothus have encroached on oak woodlands and grasslands. In approximately one third of T37S, R4W, sections 18 and 17, the 1987 Savage Creek fire burned through the ground vegetative layer and midcanopy layers. This simplified the stand structure to single or to an irregular pattern in two canopy layers.

Mistletoe is present in the Douglas-fir in a few of the mature stands and old-growth conifers but is not a major problem in the watershed. Infestations of mistletoe in the pine species is present and is a concern from the perspective of individual tree vigor and infection of pine regeneration. Stem rots are present in all tree species but are not extensive enough to be a real concern relative to overall stand health.

H. SPECIES AND HABITATS

1. Introduction

The responsibilities of the federal agencies include the active management of special status species and their habitats, Survey and Manage species and their habitat, special areas and native plants. The following are special status protection categories used as guidelines for management of special status species and their habitats.

Listed and proposed listed species are those species that have been formally listed by the U.S. Fish and Wildlife Service (USFWS) as endangered or threatened or officially proposed for listing. The goals are to enhance or maintain critical habitats, increase populations of threatened and endangered plant species on federal lands, and to restore species to historic ranges consistent with approved recovery plans and federal land use plans after consultation with federal and state agencies.

Survey and Manage species were identified by the Northwest Forest Plan ROD as needing special management attention (USDA / USDI 1994). These species must be managed at known sites and located prior to ground-disturbing activities (survey strategy 1 & 2). Some species listed in the NFP need to be inventoried extensively, and, if any are found, some of the sites need to be managed (survey strategy 3). A regional survey would be conducted on survey strategy 4 species.

Candidate and Bureau-sensitive species are federal or state candidates and those species that BLM feels might become federal candidates. The broad goal is to manage habitats to conserve and maintain populations of candidate and Bureau-sensitive plant species at a level that will avoid endangering such species that could lead to listing as endangered or threatened by either state or federal governments.

State-listed species are those plants listed under the Oregon Endangered Species Act. Conservation will be designed to assist the state in achieving its management objectives.

Bureau Assessment species are those species considered by the BLM to be important species to monitor and manage, but not to the same extent as candidate or Bureau-sensitive species. The goal is to manage where possible so as not to elevate their status to any higher level of concern.

BLM Tracking species and *BLM watch species* are not currently special status species, but their locations are tracked during surveys to assess future potential needs for protection.

2. Terrestrial

a. Botanical

There is a limited amount of late-successional, structurally-diverse forest habitat suitable for Survey and Manage species in the Murphy Watershed. This is especially true in the northern part of the watershed where south-facing aspects predominate. Even so, twenty-two populations of Survey and Manage vascular plant species have been located. A majority of these populations have been found in riparian areas or moist draws, primarily on northerly aspects. This could be an artifact of the surveys themselves which have focused on timber harvesting projects. Nevertheless, population numbers are high considering the small extent of late-successional forest habitat and the small acreage surveyed to date. This could mean that any moist north aspect habitats in the watershed have a high potential for Survey and Manage vascular plant species.

Since only approximately one half of the Murphy Watershed has been surveyed, characterization of the current conditions is based on consideration of the potential habitats of the species that have been found. The majority of late-successional forest habitat is located in the late-successional reserve where few surveys have been completed. Five populations have been found in the 354 acres of LSR that have been surveyed (5% of the LSR acreage). The late-successional forest conditions in the watershed provide habitat for the following species: *Cypripedium fasciculatum* (Clustered Lady slipper) (CYFA), *Cypripedium montanum* (Mountain Lady slipper) (CYMO) and *Allotropa virgata* (Candystick) (ALVI). According to the NFP's Management Recommendations for Vascular Plants

(USDA / USDI 1999), CYFA and CYMO are most likely found in areas with 60-100% shade provided by older stands of various plant communities within Douglas-fir forests. It further notes that although these species are not attached to a specific vegetative community, they are dependent on specific microsite characteristics, including a high percent of shading, high moisture, and undisturbed mychorrhizal connections in older age class forests. These underground mychorrhizal associations are required by these plants before germination can even take place.

The plant series' most likely to harbor these orchids within the Murphy Watershed are Douglas-fir or Douglas-fir / Pine series in a mature / old-growth condition class. Currently, 65% of the BLM land in the watershed falls into these plant series'. Only 34% of BLM land is in a mature condition class. The actual viable habitat for these species would be at an even smaller percentage and would be limited to microsites with moister, north aspects, larger condition classes and 60-100% canopy closure. *Allotropa virgata* is also found in late-successional forest habitats where conditions are drier. It is linked to dead and down components of the forest ecosystem as well as undisturbed mychorrhizal associations. Without intensive field surveys it is difficult to determine the actual amount of habitat that exists for these three species in the watershed.

The Survey and Manage vascular species are also found mostly in the portions of the watershed with a high fire hazard rating. Although all the Survey and Manage vascular species have been known to tolerate, and possibly even thrive from, low-intensity fire, it has also been shown that such plants will not survive a high-intensity fire.

The Bird's-foot fern (*Pellea mucronata ssp. mucronata*) is the one Bureau Sensitive species found in the watershed. The species does not appear to be rare in California, but had not been found in Oregon until this population sighting which thus constituted an extension of the known range of the species. The population is located in a rocky opening in the Douglas-fir / poison oak plant association. Another *Pellea* species that has yet to be identified has also been found in the watershed on a more open, rocky ridgetop. It is either a newly-discovered species or a hybrid between *Pellea mucronata ssp. mucronata* and a more common *Pellea* species.

The Bureau Assessment species *Lotus stipularis var. stipularis* has been located in the watershed. This siting is far north of the plants main population centers in California. It is a rare variety about which there are still some taxonomic questions. The species prefers openings and appears to be substituting disturbed openings as habitat for the natural openings that probably occurred more frequently under a natural fire cycle. Most known populations of this species in the Resource Area are located in the Rogue - Recreation watershed to the northwest.

One Bureau Tracking species, *Lithophragma heterophyllum,* has been found in the watershed. It is informally considered to be a unique variety, called the Applegate variety. Population numbers appear stable in the watershed. Two Bureau Watch species, *Smilax californica* and *Perideridia howellii*, have also been found. These uncommon species are found in low-elevation riparian areas within conifer forests and wetlands, respectively.

Serpentine habitat is very limited in the Murphy Watershed and found only in a small portion of the LSR. The primary plant series for these areas is Jeffrey pine which covers 7% of BLM land in the watershed. It is unknown which serpentine-endemic species occupy this habitat as surveys have not been conducted in this portion of the watershed.

Invasion of noxious weeds could eventually affect special status plants. Though a thorough inventory of noxious weeds has not been completed in the watershed, their occurrence has been documented. One species, *Centaurea solstitialis* (yellow star thistle), is most common in the lower-elevation areas, especially in grasslands adjacent to agricultural developments where the species has become quite aggressive. The species is a threat because it will outcompete native valley grassland and woodland vegetation, thereby reducing native plant diversity. The species is a large enough problem in the Applegate Valley that an interagency effort is being conducted with cooperating private land owners to develop a control strategy for the species.

Table III - 7: Special Status / Survey and Manage Plants - Murphy Watershed

Species Name	Species Status	Habitat
Cypripedium fasciculatum	SM/SC/BS	Moist mixed evergreen with filtered sun
Cypripedium montanum	SM	Moist to dry mixed evergreen
Allotropa virgata	SM	Moist to dry mixed evergreen
Dendriscocaulon intricatulum	SM	Black oaks
Lobaria hallii	SM	Oak species
Pellea mucronata ssp. mucronata	BA	Rocky, dry openings
Lotus stipularis var. stipularis	BA	Open forests, disturbed areas

SC = Species of Concern, SM = Survey and Manage species, BS = Bureau Sensitive, BA = Bureau Assessment

b. Wildlife

The Murphy Watershed contains a diverse array of wildlife. As many as 11 species of bats, 12 species of amphibians, 18 species of reptiles, hundreds of species of birds, and many thousands of species of insects may occur here. All but three indigenous mammals (grizzly bear, wolf and wolverine) are thought to still to occur in the watershed.

(1) Habitats

Wildlife habitats in southwest Oregon are extremely complex. Terrain, climatic factors and vegetation combine to create the wealth of habitats found from the valley floor to the peaks of the Siskiyou mountains. The Murphy Watershed is characterized by the broad valley floor of the Applegate River and higher surrounding hillsides. The area north of the river has primarily south-facing aspects. This limits the potential types of plant communities and habitats. This area is hot and dry in the summer and is dominated by a combination of grasslands, brush fields, pine stands and oak woodlands. Mature and old-growth Douglas-fir forest are naturally rare on the northside of the Applegate River and are generally associated with riparian areas. The valley floor is dominated by agricultural land and is relatively less urbanization than the Rogue Valley. Natural stands of valley-bottom vegetation are scattered throughout BLM land. Most are, however, currently outside of natural range of variability due to fire suppression. On non-BLM lands, most of the natural vegetation has been converted to grazing and agriculture. The southern portion of the watershed is dominated by coniferous forest. The age and the structure of these forests range from saplings to old growth. Unique habitats include the Jeffrey Pine savannahs located at the headwaters of Case Creek and low-elevation old-growth forest.

The various plant communities and habitats support an array of native wildlife. Animals require food, water, shelter and space to breed and raise young. Some species have adapted to a particular habitat (specialists) while others utilize a great number of different plant communities to fulfill their needs (generalists).

Habitats that are an issue in the watershed include: late-successional (mature and old growth) forest, meadows, pine stands, oak groves, Jeffrey pine savannahs, oak savannahs and riparian habitat. All of these habitats have been affected by human activity.

(2) Valley Habitats

The Murphy Watershed is composed of numerous drainages flowing toward the mainstem of the Applegate River. These drainages are typified by a limited area of valley habitat and steep hillsides dominated by conifers in the south and grasslands in the north. Currently, fire suppression programs and goals are the largest threat to maintaining the remaining undisturbed native valley habitat. A history of fire suppression has led to a reduction in the quantity and quality of these habitats which include oak savannahs, meadows, pine forest and chaparral. These habitats are four of the five critical habitats identified by the Oregon / Washington neotropical bird working group. Further reduction and change to these habitats would likely have an adverse impact on neotropical migrant birds.

Native valley habitats have suffered some of the greatest declines in plant communities in southwestern Oregon. Due to the changing nature of private land management, the remaining tracts of public land provide the areas for the perpetuation all types of habitat and the biodiversity they support. These stands provide primary nesting habitat for acorn woodpeckers *(Melanerpes formicivorous)* and western bluebirds *(Sialia mexicana)* as well as winter range for blacktail deer *(Odocoileus hemionus)*. Smaller mammals using this habitat include raccoon *(Procyon lotor)* and grey fox *(Urocyon cinereoargenteus)*.

(3) Upland Habitats

Federal lands found above the valley floor in the south part of the watershed are dominated by a very diverse forest composed of a blend of hardwoods, conifers, shrubs, and herbaceous plants. Many of the hardwoods are berry and mast producers which offer a rich food source for wildlife. Mast crop producers include California black oak *(Quercus kelloggii)*, Oregon white oak *(Quercus garryana)*, tanoak *(Lithocarpus densiflorus)*, and California hazel *(Corylus cornuta)*. Berry- producing plants such as Pacific madrone *(Arbutus menziesii)* and manzanita *(Arctostaphylos spp.)* are also important crop producers for wildlife. Habitats within the uplands include old growth, meadows, riparian areas, chaparral, pine savannahs and oak stands.

Natural disturbances are important in generating and maintaining a number of plant communities and habitats. Human-caused disturbances such as logging, mining, and road building have all affected the condition of the upland forest. The condition of the forest determines wildlife species abundance and diversity. The shift from older, structurally-diverse forests to younger, structurally-simplified forests has benefitted generalist species, but has not been advantageous to species that depend on late-successional habitat. The most extensive disturbance activity in the southern portion of the watershed has been logging. Currently most private lands and county lands are in an early seral stage to pole stage, with little mature forest. Condition of federal land varies from past clearcuts to old growth. Most federally-managed stands are in the 21"+ diameter range. The majority of the late-successional forest habitat is in located Iron, Jackson and Murphy Creeks' within the LSR. Late-successional habitat located outside is these areas are often heavily fragmented and may not provide quality interior forest conditions.

To facilitate past timber extraction, numerous roads were constructed throughout the southern portion of the watershed. High road density have many adverse impacts on wildlife. Roads lead to increases in vehicular and human disturbance, provide access for poaching and further fragment areas of late-successional habitat. The watershed has seen a large increase in the road density on federal land since World War II. The areas currently with low road densities offer important refugia from human disturbance for species such as black bear.

The part of the watershed found north of the Applegate River varies greatly from a habitat perspective. Here open grasslands, brush fields, and oak woodlands dominate the landscape. Conifer forest is restricted to pockets created by microclimatic conditions due to aspect changes, riparian areas, or areas shaded by topographical features. Here moisture and soil have combined to create pockets of late-successional forest habitat .

Historically the northern portion of the watershed burned frequently. This served to maintain the variety of vegetative types and habitats. The area has not experienced a significant burn for more then 40 years, however, and habitats once maintained by fire are at the edge of or are outside of their natural range of conditions.

(4) Riparian Habitat

Riparian areas are one of the most heavily used habitats found in the watershed, both by humans and by wildlife. Many life cycle requirements of animals are met in these areas. Aquatic and amphibious species are intrinsically tied to these habitats, as are all the species that feed on these animals. Riparian habitats have been heavily affected by mining, road building and logging. The riparian zone on private lands varies from mature stands of conifers to bare streambanks. Most of the private riparian is dominated by hardwoods and young conifers. Riparian areas on federal lands are generally in better condition than private but still have been affected by past practices such as mining and timber harvest.

The amount of water allowed to flow from a creek's source to the Applegate River determines the usefulness of streams to aquatic species. Low-flow conditions are exacerbated by water withdrawals can ultimately determine the absence / presence of many aquatic species. Currently many native aquatic and amphibious species are no longer as prevalent as they probably were during pre-European settlement times.

(5) Specialized Habitats

Special and unique habitats are those habitats that are either naturally scarce (*e.g*, caves, springs, mineral licks), rare because of human influence on the environment (e.g, low-elevation old-growth forest, oak / grasslands), or few because of natural cycles (snags, meadow production, *e.g.*). Often these habitats receive a greater level of use by wildlife than surrounding habitats, or are essential for certain aspects of a particular animal's life history (*e.g.*, hibernation).

The Murphy Watershed contains a number of unique habitats the continued presence of which will determine presence of many sensitive wildlife species. Particular sensitive habitats are discussed in the following paragraphs.

Old-growth forest habitat is a forest stand with a multicanopy structure, dominated by large trees, snags and large down logs. Due to the wide variety of niches, these forests have a greater diversity of wildlife species than do younger forest stands. This habitat type is principally located in Jackson, Spencer and Iron Creeks in the southern part of the watershed and in the Rocky / Miller Creek area north of the Applegate River. The 286 acre Iron Creek ACEC was identified for its quality as low-elevation old-growth forest.

Patch size of the old-growth stands partially determines their usefulness to some species of wildlife. Small, fragmented stands may offer refugia for species with limited home ranges, but do not provide optimal habitat for species with larger home ranges. Large stands (>100 acres) are very important contributors to maintaining the biodiversity of the watershed. Very little old-growth forest occurs on private land in the watershed.

Meadows on federal land are common in the northern half of the watershed. Shallow soils, perched water tables, southern aspects and old homesteads are the most common cause of these meadows. Earlier in the century, many natural meadows were converted to agricultural land use homesteaders. Currently, the most significant threat to this habitat is tree encroachment due to the disruption of the natural fire cycle. Meadows are the primary habitat for a number of species such as California vole (*Microtus californicus*) and the western pocket gopher (*Thomomys mazama*) and are the primary feeding location for species such as the great grey owl (*Strix nebulosa*) and the American black bear (*Ursus americanus*).

Big game winter range in the watershed is in poor condition due to fire exclusion. As plants become older they lose their nutritional value, become woody and less palatable, and often form dense impenetrable stands which impede the ability of animals to browse. This is particularly true of buck buckbrush (*Ceanothus cuneatus*), an important forage plant. Winter range generally is defined as land below 2,000 feet in elevation, but extends higher in elevation on southern exposed slopes. Ideally, these areas are a mixture of thermal cover, hiding cover, and forage. Historically the valley floor and adjacent slopes served as winter range for deer and elk. Most of the winter range has not had a significant fire in more than 40 years.

Dispersal corridors aid in gene-pool flow, natural reintroduction and successful pioneering of species into previously unoccupied habitat. Generally these corridors are located in saddles, or low divides and ridges, and along riparian reserves. Without such corridors many isolated wildlife habitats would be too small to support the maximum diversity of species. Numerous ridge lines within the watershed allow for localized dispersal as well as regional dispersal. The Wildeer ridge system ties areas in the Kangaroo roadless area near Oregon Caves to Mungers Butte and to the northern part of the watershed. Pockets of late-successional habitat occurring north of the river allow for movement of more mobile species such as the northern spotted owl between the Rogue and Applegate Valleys. The low divide between Jackson Creek and North Fork Deer Creek allows for movement under continuous canopy conditions between the two. Other remaining blocks of older forest that contiguously run from the valley floor to the higher mountain ridges allow for "the elevator effect" which permits for seasonal dispersal of late-successional species. Examples of can be found in the Spencer Creek, Iron Creek and Jackson Creek drainages. Many of the key flow locations have the potential to support older forest, but currently do not due to past management activities and other disturbance.

Oak woodlands / savannahs are a rich resource providing nesting habitat, mast crop production, big game wintering range and sheltered fawning areas. Many of these areas have been encroached by conifers due to the exclusion of fire. Stands of oak / grasslands on federal land are scattered throughout the watershed but primarily occur north of the Applegate River.

Mine adits play a critical role in the life history of many animals, providing shelter from environmental extremes, seclusion and darkness. Mines are the primary habitat for species such as the Townsend's big-eared bat *(Corynorhinus townsendii)*, which a ROD buffer species and a Bureau Sensitive species. Other species such as the bushy-tailed wood rat *(Neotoma cinerea)* and the cave cricket *(Ceuthophilus spp.)* use caves as their primary residence. These sites are also used seasonally by a number of species. Examples of such uses are swarm sites (breeding sites) for bats and den sites for porcupines *(Erethizon dorsatum)*. A number of mine adits are located on federal land in the watershed. Minimal disturbance to these sites is important to the continued viability of these sites. Some of these sites are also used for recreation as well as being important habitats.

Four ponds are located in the Spencer Creek drainage on federal land. These ponds were originally built to provide a water source for fire suppression, but currently provide a habitat generally not found on federal land. The ponds provide slow moving water habitat that is important for a number of amphibians such as the northwest salamander (*Ambystoma gracile*). The ponds have not been maintained for a number of years and are in poor condition.

Deer fawning / elk calving areas are critical for successful maintenance of deer and elk populations. Key components include quality forage, water, cover, and gentle warm slopes. Fawning areas on federally-administered lands are found in many small meadows scattered throughout the watershed and in areas with southern exposures. Fawning areas on private land are found throughout the watershed but vary in quality due to disturbance.

(6) Special Status Species

There are 60 potential sensitive species in the watershed: 19 birds, 13 mammals, 7 amphibians, 5 reptiles, 8 insects, and 6 mollusks. The habitat requirements for these animals vary from species to species. The northern spotted owl is the only species documented as nesting in the watershed that is listed under the Endangered Species Act. Bald eagles are often sighted foraging along the Applegate River, but it is suspected that they nest in an adjacent watershed. In addition to the known listed species there are also candidate species, Bureau Sensitive species, ROD buffer species, and Survey and Manage species (see NFP, C-49).

Table III - 8 lists the known and potential special status vertebrate species found in the watershed, along with legal status and level of survey that has been completed to date. Table III - 9 lists the known and potential special status invertebrate species. These lists include species listed under the ESA, those proposed for listing, and candidate species being reviewed by the USFWS. Oregon state listed species, Bureau Assessment species, and species listed in the ROD as Buffer species are also noted (for more information on this list and habitat needs see Appendix E).

Table III - 8: Murphy Watershed - Potential Special Status Species (Vertebrates)

Common Name	Scientific Name	Presence	Status	Survey Level as of 5/97
Gray wolf	*Canis lupus*	absent	FE,SE	none to date
White-footed vole	*Aborimus albipes*	unknown	BS,SP	none to date
Red tree vole	*Aborimus longicaudus*	present	SM	limited surveys
California red tree vole	*Aborimus pomo*	unknown	BS	none to date
Fisher	*Martes pennanti*	present	BS,SC	none to date
California wolverine	*Gulo gulo luteus*	unknown	BS,ST	none to date
American marten	*Martes americana*	unknown	SC	none to date
Ringtail	*Bassacriscus astutus*	present	SU	none to date
Peregrine falcon	*Falco peregrinus*	unknown	BS,ST	none to date
Bald eagle	*Haliaeetus leucocephalus*	seasonally	FT,ST	none to date

Table III - 8: Murphy Watershed - Potential Special Status Species (Vertebrates)

Common Name	Scientific Name	Presence	Status	Survey Level as of 5/97
Northern spotted owl	*Strix occidentlis*	present	FT,ST	limited surveys
Northern goshawk	*Accipiter gentilis*	unknown	BS,SC	some surveys
Mountain quail	*Oreortyx pictus*	present	BS	none to date
Pileated woodpecker	*Dryocopus pileatus*	present	SC	none to date
Lewis' woodpecker	*Melanerpes lewis*	unknown	SC	none to date
White-headed woodpecker	*Picoides albolarvatus*	unknown	SC,BF	none to date
Flammulated owl	*Otus flammeolus*	unknown	SC,BF	none to date
Purple martin	*Progne subis*	unknown	SC	none to date
Great gray owl	*Strix nebulosa*	unknown	SV,SM	limited surveys
Western bluebird	*Sialia mexicana*	present	SV	none to date
Acorn woodpecker	*Melanerpes formicivorus*	present	SU	none to date
Tricolored blackbird	*Agelaius tricolor*	unknown	BS,SP	none to date
Black-backed woodpecker	*Picoides arcticus*	unknown	SC,BF	none to date
Northern pygmy owl	*Glaucidium gnoma*	present	SU	limited surveys
Grasshopper sparrow	*Ammodramus savannarum*	unknown	SP	none to date
Bank swallow	*Riparia riparia*	migratory	SU	none to date
Townsend's big-eared bat	*Corynorhinus townsendii*	present	BS,SC	limited surveys
Fringed myotis	*Myotis thysanodes*	present	BS,SV,BU	limited surveys
Yuma myotis	*Myotis yumanensis*	present	BS	limited surveys
Long-eared myotis	*Myotis evotis*	present	BS,BU	limited surveys
Hairy-winged myotis	*Myotis volans*	present	BS	limited surveys
Silver-haired bat	*Lasionycterus noctivagans*	suspected	BF	limited surveys
Pacific pallid bat	*Antrozous pallidus*	unknown	SC	limited surveys
Western pond turtle	*Clemmys marmorata*	present	BS,SC	incidental sightings
Del Norte salamander	*Plethodon elongatus*	present	BS,SV,SM,BF	limited surveys
Foothills yellow-legged frog	*Rana boylii*	suspected	BS,SU	limited surveys
Red-legged frog	*Rana aurora*	unknown	BS,SU	none to date
Clouded salamander	*Aneides ferreus*	suspected	SC	limited surveys
Southern torrent salamander (variegated salamander)	*Rhyacotriton variegatus*	unknown	BS,SV	limited surveys

Table III - 8: Murphy Watershed - Potential Special Status Species (Vertebrates)

Common Name	Scientific Name	Presence	Status	Survey Level as of 5/97
Black salamander	*Aneides flavipunctatus*	suspected	SP	limited surveys
Sharptail snake	*Contia tenuis*	suspected	SC	none to date
California mountain kingsnake	*Lampropeltis zonata*	present	SP	incidental sightings
Common kingsnake	*Lampropeltis getulus*	present	SP	incidental sightings
Northern sagebrush lizard	*Sceloporus graciosus*	unknown	BS	none to date
Tailed frog	*Ascaphus truei*	suspected	SV	none to date

STATUS ABBREVIATIONS:
FE--Federal Endangered
SP--ODFW Peripheral or Naturally Rare
BS--Bureau Sensitive
SC--ODFW Critical
ST--State Threatened
FT--Federal Threatened
FC--Federal Candidate
BF--Buffer Species
SV--ODFW Vulnerable
SU--ODFW Undetermined
SM--Survey and Manage
FP--Federal Proposed
SE--State Endangered

Table III - 9: Murphy Watershed - Potential Special Status Species (Invertebrates)

Common Name	Presence	Status	Survey Level as of 5/97
Burnells' false water penny beetle	unknown	BS	none to date
Denning's agapetus caddisfly	unknown	BS	none to date
Green Springs Mtn. farulan caddisfly	unknown	BS	none to date
Schuh's homoplectran caddisfly	unknown	BS	none to date
Obrien rhyacophilan caddisfly	unknown	BS	none to date
Siskiyou caddisfly	unknown	BS	none to date
Alsea ochrotichian micro caddisfly	unknown	BS	none to date
Franklin's bumblebee	unknown	BS	none to date
Oregon pearly mussel	unknown	BS	none to date

BS = Bureau Sensitive

(7) Survey and Manage Species

Table III - 10 presents the species that are to be protected through survey and management guidelines outlined in the NFP. This table also notes the level of protection and the extent of surveys conducted to date.

Table III - 10: Survey and Manage Species & Buffer Species in the Murphy Watershed

Species	Presence	Protection Level (NFP-ROD)
Del Norte salamander *@ *(Plethodon elongatus)*	present	Manage known sites and survey prior to activities, within matrix land buffer length of 1 potential site tree or 100 feet which ever is greater.
White-headed woodpecker* *(Picoides albolarvatus)*	unknown	On matrix land no cutting snags 20" DBH or over. Maintain green trees to provide for 100% population potential
Black-backed woodpecker* *(Picoides pubescens)*	unknown	On matrix land no cutting snags 20" DBH or over. Maintain green trees to provide for 100% population potential
Flammulated owl* *(Otus flammeolus)*	unknown	On matrix land no cutting snags 20" DBH or over. Maintain green trees to provide for 100% population potential
Great gray owl@ *(Strix nebulosa)*	unknown	1/4 mile protection zone around nest sites, survey prior to activities, 300 foot buffers of meadow and natural openings.
Red tree vole@ *(Aborimus pomo)*	present	Manage known sites and survey prior to activities

* = Buffer species, @ = Survey and Manage

Table III - 11: Survey and Manage Mollusc Species

Species	Presence
Blue-grey taildropper *Prophysaon coeruleum*	Suspected in watershed
Papillose taildropper *Prophysaon dubium*	Suspected in the watershed
Chace sideband *Monadenia chaceana*	Unknown if present in the watershed
Oregon megomphix *Megophix hemphilli*	Unknown if present in the watershed
Helminthoglypta hertleini	Suspected in the watershed
Tehama chaparral Trilobopsis tehamana	Unknown if present in the watershed

(8) Threatened or Endangered Species

(a) Northern Spotted Owl

The northern spotted owl is the only species listed under the ESA known to nest in the watershed. It is listed as a threatened species. There are eleven known centers of activity, seven of which are located in the LSR and four of which are located in the Matrix land allocation. In addition there are three sites outside the watershed boundaries whose provincial home range (1.3 mile radius) may be affected by activities occurring inside the watershed (see Appendix D for the list of sites of nesting surveys). An active site is one which a territorial single or pair has occupied at least once since 1985. Surveys for northern spotted owls have been conducted within the watershed since the mid-1970's. Early surveys were opportunistic. Beginning in 1985, areas were formally surveyed as a part of forest management project planning work.

The USFWS uses the amount of suitable habitat around spotted owl sites as an indication of the site's viability and productivity. Threshold levels that have been defined for suitable habitat are 50% of the area within 0.7 mile of the center of activity (approximately 500 acres), and 40% of the area within 1.3 miles (approximately 1,388 acres).

Table D-1 in Appendix D describes the condition of the sites within or adjacent to the watershed. One site within the watershed exceeds the 1,388 acres necessary for long-term viability.

(i) Federal Land

Spotted owl habitat on BLM-administered land has been analyzed using the McKelvey rating system. The McKelvey rating system is based on a model that predicts spotted owl population based on habitat availability (see Appendix D for more information on this system). Stands were examined for criteria such as canopy layering, canopy closure, snags, woody material and other features. The biological potential of a stand to acquire desired conditions is also taken in consideration. During the spring of 1997 stands were visually rated and placed into the six categories. Map 7 displays the results of this study. Table III -12 summarizes the amount of spotted owl habitat currently in the watershed.

There are 869 acres of spotted owl nesting, roosting, and foraging habitat (McKelvey rating #1) on BLM land in the watershed (2% of the total watershed). The largest contiguous blocks are located in the Spencer, Jackson, Miller, Rocky and Iron Creek drainages.

There are 4,478 acres of spotted owl roosting and foraging habitat (McKelvey rating #2) on BLM land in the watershed (11% of the total watershed). The largest patches are found along Miller Creek, and Hidden Creek, Pennington Mountain, and Grays' Ridge

Dispersal habitat for spotted owls is represented by defined as stands that have a canopy closure of 40% or greater, with enough openings for flight and predator avoidance. This habitat is limited to the southwest and northeast portions of the watershed.

Table III - 12: Acres of McKelvey Rating Classes

Class **	BLM Lands		Nonfederal Lands (State, County, Private)		All lands	
	Acres	% of total Watershed	Acres	% of total Watershed	Acres	% of total Watershed
1	869	2%	0	0%	869	2%
2	4,478	11%	494	1%	4,972	12%
3	3,816	9%	1,695	4%	5,511	13%
4	3,889	9%	17,025	41%	20,914	50%
5	3,141	8%	5,041	12%	8,182	20%
6	1,187	3%	28	0%	1,215	3%
Total	17,380		24,283		41,663	

*This information was collected during the summer of 1997, and may not reflect the current condition.

** McKelvey Class:
1- Spotted owl nesting, roosting, and foraging habitat
2- Spotted owl roosting and foraging
3- Currently does not meet 1 or 2 criteria
4- Will never meet 1 or 2 criteria
5- Currently does not meet 1 or 2, but meets dispersal
6- Will never meet 1 or 2 but meets dispersal

(ii) Private and County Land

In 1997 an effort was made by the BLM to classify the forest type on private and county lands in the watershed using the McKelvey model. This information was largely gathered through aerial photo interpretation, ground truthing and roadside reconnaissance. Table III - 12 displays the results of this and shows that there is no optimal habitat, but there are 494 acres of spotted owl roosting and foraging habitat. It should be pointed out that most of the private land (17,025 acres) does not have the potential to support late-successional forest habitat. Currently there are 6,764 acres of private land functioning as northern spotted owl dispersal habitat.

(9) Late-Successional Reserve / Critical Habitat

(a) Northern Spotted Owl

The Murphy Watershed contains a portion of the East IV - Williams Deer Late-Successional Reserve. In addition, a portion of the watershed has been designated by the USFWS as critical habitat for the northern spotted owl. These two designations are not synonymous. The overall LSR system was designed to function as the federal land management agencies' contribution to the recovery of the owl under the Northwest Forest Plan. USFWS designated critical habitat was effectively superceded by the LSR system. It should be noted that some land is naturally not capable of supporting late-successional forest habitat. Those lands classified as McKelvey rating category 3 and 5 have the biological potential to be late-successional habitat although they are not currently.

(b) Marbled Murrelet

The marbled murrelet is listed as a threatened species. Critical habitat for marbled murrelet was designated by the USFWS in May of 1996. No land within the Murphy Watershed was identified as critical habitat, but federal agencies are still responsible for determining absence / presence in suitable habitat within 50 miles of the coast. Nesting habitat for marbled murrelet consists of older forest stands with trees that have large moss-covered limbs and high (70%) canopy closure. This habitat is further defined by its distance from the coast. Based on current MicroStorms inventory information and field verification of McKelvey rating, there are approximately 2,932 acres of suitable marbled murrelet habitat on lands managed by the BLM in the watershed. For the most part these stands have the same characteristics as spotted owl suitable / optimal habitat (see McKelvey map). There are no known nest locations within the Murphy Watershed. It is unknown at this time if the stands that meet habitat requirements for marbled murrelet would be used by them. These sites are generally warmer and drier then those located closer to the coast that are occupied by nesting murrelets.

(c) Bald Eagles (Threatened)

At this time there are no known nest sites documented within the watershed but these birds do forage along the Applegate River. Nesting habitat occurs on federally-administered land as well as state of Oregon land downstream along the Rogue River. Preferred nesting habitat is characterized by older forest, generally near water, that experience minimal human disturbance.

(10) Other Species of Concern

(a) Neotropical Migratory Birds

A large number of neotropical birds are known in the Murphy Watershed. Neotropical birds are migrants that winter south of the Tropic of Cancer and breed in North America. More than twenty years of Breeding Bird Surveys (BBS), Breeding Bird Census (BBC), Winter Bird Population Studies, and Christmas Bird Counts indicate that many species of this group of birds are experiencing a precipitous decline in population. This is particularly true for birds that use mature and old-growth forest either in the tropics, in North America or in both (DeSante & Burton 1994). Rates of decline are well documented for birds on the east coast of North America but less so on the west coast. In 1992 the BLM signed a multiagency agreement called "Partners in Flight." The purpose of this program is to establish a long-term monitoring effort to gather demographic information. This monitoring will establish the effects that deforestation and forest fragmentation have on breeding temperate bird populations.

The Murphy Watershed contains a number of neotropical migrants that utilize various habitats. Studies conducted in the adjacent Williams Watershed found that neotropical migrants comprise between 42% and 47% of the breeding species in lower-elevation forests dominated by Douglas-fir (Janes 1993). In higher-elevation forests dominated by white fir, neotropical migrants are less abundant and represent a smaller percentage of the bird species present. Table III - 13 lists the known or suspected neotropicals found in the watershed and the national population trends. Neotropical bird habitats of particular concern are valley brush fields, old-growth conferous forest, riparian, and oak woodland. While a neotropical species may prefer one habitat, it will often use more than one habitat type during various seasons. Overall, 46% of these species are habitat generalists using four or more habitat types, while 34% are habitat specialists utilizing only one or two habitats.

Table III - 13: Neotropical Birds Potential in the Murphy Watershed

Common Name	Presence	Nationwide Trend*
Green-winged teal	unknown	insufficient data
Sora	unknown	insufficient data
Turkey vulture	present	decline
Osprey	present	stable or increasing
Flammulated owl	unknown	insufficient data
Common nighthawk	present	insufficient data
Rufous hummingbird	present	decline
Calliope hummingbird	unknown	insufficient data
Western kingbird	present	insufficient data
Ash-throated flycatcher	present	insufficient data
Western wood-pewee	present	decline
Olive-sided flycatcher	present	decline
Hammond's flycatcher	present	insufficient data
Dusky flycatcher	present	insufficient data
Pacific-slope flycatcher	present	insufficient data
Vaux's swift	present	decline
Tree swallow	present	insufficient data
Northern rough-winged swallow	present	insufficient data
Violet-green swallow	present	decline
Cliff swallow	present	insufficient data
Barn swallow	present	decline
House wren	present	insufficient data

Table III - 13: Neotropical Birds Potential in the Murphy Watershed

Common Name	Presence	Nationwide Trend*
Blue-gray gnatcatcher	present	insufficient data
Swainson's thrush	present	decline
Solitary vireo	present	insufficient data
Warbling vireo	present	insufficient data
Townsend's warbler	present	insufficient data
Hermit warbler	present	insufficient data
Black-throated gray warbler	present	insufficient data
Nashville warbler	present	insufficient data
Macgillivray's warbler	present	insufficient data
Yellow warbler	present	insufficient data
Orange-crowned warbler	present	decline
Common yellowthroat	present	stable / increase
Yellow-breasted chat	present	insufficient data
Wilson's warbler	present	decline
Brownheaded cowbird	present	decline
Northern oriole	present	decline
Western tanager	present	decline
Chipping sparrow	suspected	decline
Green-tailed towhee	present	stable / increase
Black-headed grosbeak	present	stable / increase
Lazuli bunting	present	insufficient data

* Based on information from Partners in Flight in Oregon and might not necessarily represent nationwide figures.

(11) Game Species

Species of game animals located within the Murphy Watershed include elk, blacktailed deer, black bear, mountain lion, wild turkeys, ruffed grouse, blue grouse, grey squirrels, and mountain and valley quail. The watershed is located in the Chetco game management unit. Management of game species is the responsibility of the Oregon Department of Fish and Wildlife (ODFW). The entire watershed is open to hunting during the appropriate season for game species. Information from the ODFW indicates that blacktailed deer populations are stable overall and meeting department goals.

Black bear populations are extremely hard to monitor due to their secretive nature. The population in the watershed appears to be stable. Cougar sightings in the watershed have increased as the overall population increases.

Grouse and quail had a poor nesting year in 1998. The populations of these birds are cyclic and are dependent on weather conditions. Long-term trends appear to be stable. Wild turkeys have not been introduced in this watershed, but appear to have established themselves from adjacent watersheds.

In general, game species are generalists that benefit from edge habitats. Past land management practices both on private and federal lands have increased the overall amount of forest edge within the watershed. In addition, the number of roads has also increased which in turn affects the suitability of all habitat types. High road densities have been shown to have negative affects on deer and elk populations, and to lead to increased poaching opportunities. For these species, numbers could be expected to increase with a decrease in the road density. Remaining unroaded sections offer key refugia for these species.

Band-tail pigeons (Columba fasciata) are known to occur in the watershed. These birds have shown a precipitous decline in population throughout their range since monitoring began in the 1950's (Jarvis and Leonard 1993). These birds are highly prized as a game species and restrictive hunting regulations have not led to an increase in bird populations. Habitat alteration due to intense forestry practices may partially explain their decrease in population and ongoing research is now trying to answer this question (Jarvis and Leonard 1993). Band-tail pigeons are highly mobile and utilize many forest habitat types. Preferred habitat consists of large conifers and deciduous trees interspersed with berry-and mast-producing trees and shrubs. In the spring and fall, large flocks are seen migrating through the watershed. The birds use this higher-elevation to feed on blue elderberries, manzanita berries, and Pacific madrone berries. With the exclusion of fire from the landscape many stands of mast-producing plants have been negatively affected.

(a) Cavity-Dependent Species

Cavity-dependent species, such as western bluebirds and northern pygmy owls *(Glaucidium gnoma)*, which use downed logs are of special concern in the watershed because of past silvicultural practices. These practices have focused on even-aged stands and have created areas with low snags and down log densities. Fire suppression has also served to reduce the density of snags in the watershed. Fires, insect infestations and other disturbance events are important generators of snags. Consequently, populations of cavity-dependent species have no doubt declined.

(b) Exotic Species

Many non-native species have become established in the watershed. Introduced exotic species compete with native species for food, water, shelter and space. Bullfrogs (*Rana catesbeiana*) directly compete with native frogs, and consume young western pond turtles (*Clemmys marmorata*). Opossums (*Dedelphis virginiana*) occupy a similar niche as the native striped skunk (*Mephitis mephitis*) and raccoon (*Procoyon lotor*). They also consume young birds, amphibians and reptiles.

Other introduced species include European starlings (*Sturnus vulgaris*), ring-necked pheasants (*Phasianus colchicus*), and turkeys (*Meleagris gallopavo*). These species have some negative effects on native flora and fauna.

3. Aquatic Habitats and Species

a. General

Large woody debris contributes to riparian and stream habitat by providing both shade and nutrients for terrestrial and aquatic insects. Large woody material is important for creating the habitat complexity needed to rear juvenile anadromous fish and to provide cover for adults during migration. Stream meander is important for dissipating stream velocity and increasing winter refuge habitat for juvenile fish, especially for coho salmon. Adult and juvenile fish production can also be limited by migration barriers such as road culverts. Yearling juvenile fish can move miles within one watershed, especially during summer months when they seek cool waters. Excessive sedimentation, especially if delivered at wrong time intervals, can delay adult migration and spawning and suffocate eggs in the redds. Suspended sediment can cause gill damage and secondary infections on overwintering juvenile fish which have been stressed from the lack of sufficient overwinter habitat to new escape from high water velocities.

Roads located next to streams can disconnect streams from the floodplain, impede stream meander and act as heat sinks. Heat sinks transfer heat to the riparian area which consequently increases stream temperature. Timber harvesting and the presence of roads accelerate surface water runoff and erosion of sediment into the streams, resulting in decreased macroinvertebrate and fish production.

The cumulative effects of management activities have been a substantial alteration of the timing and quantity of erosion and changes in stream channels, both of which have affected fish production. Streams and riparian areas on federal lands are in better condition than streams on nonfederal lands. In some areas during low-flow periods where water flows from federal lands, it is totally withdrawn for irrigation, leaving the streambeds dry. Murphy Creek is dry or puddled in the first half mile as early as July.

b. Stream Habitat Conditions

Table III - 14 summarizes stream habitat conditions for those Class I-IV streams where ODFW protocol physical habitat surveys have been completed. The conditions are summarized based on the ODFW habitat benchmark standards (Table III - 15).

Table III - 14: Class I - IV Stream Habitat Conditions							
Stream	**Fish Bearing (Y/N)**	**LWD levels**	**Sediment levels within spawning gravels**	**Canopy Closure**	**Pool Freq.**	**Residual Pool Depth**	**Avg. Gradient (%)**
Wildcat Creek	N	U	U	U	U	U	8.6
Bull Creek	Y	U	U	U	A	U	7.0
Iron Creek	Y	U	A	U	A	U	9.5
Murphy Creek	Y	U	D	U	A/D	U	1.8
Oscar Creek	Y	U	U	A	A	U	5.0

Table III - 15: Oregon Department of Fish and Wildlife Habitat Benchmarks			
Habitat Type	**Undesirable (U)**	**Adequate (A)**	**Desirable (D)**
LWD pieces / 100 m stream length	< 10	χ	> 20
Sediment Levels (% silt in spawning gravels)	> 20	χ	< 10
Canopy Closure (%)	< 70	χ	> 75
Pool Frequency (Channel Widths Between Pools)	> 20	χ	5-8
Residual Pool Depth (m)	< 0.5	χ	> 1.0

Iron Creek is a fish-bearing tributary to the Applegate River. Resident trout are present in the first two miles. Steelhead likely occur to river mile 0.3, and probably extend their range during high flow events. Instream wood levels are below ODFW benchmark standards and there are greater levels of sediment in the spawning gravels than is desirable. Canopy closure is fairly good at 67%. Pool frequency is adequate at 10.6 channel widths per pool. Average residual pool depth is low (0.36 meters). Twenty percent of the streambanks in the lower one and a half miles are actively eroding as a result of mining activity. This is contributing to the excessive sediment within the spawning gravels.

Oscar Creek is a fish-bearing stream tributary to the Applegate River. However, an irrigation canal intercepts the stream before it enters the Applegate. Steelhead are found in the first 0.1 miles. The average gradient of Oscar Creek is 5.0 %. Instream wood is at an undesirably low level based on the benchmark standards, and the sediment within the spawning gravels exceeds the standards. Canopy closure is fairly good (69%). The pool frequency is 13 channel widths per pool, and average residual pool depth is low (0.30 meters). Twenty percent of the streambanks in the upper reaches of Oscar Creek are actively eroding as a result of mining activity. This is a major contributor of sediment to the downstream spawning gravels.

Wildcat Gulch is a tributary to the Applegate River. The stream flow is intercepted by the same irrigation canal that intercepts Oscar Creek. Fish distribution is currently unknown. The average stream gradient is 8.0 %. Instream wood levels are below desirable levels, and there is a high amount of sediment present throughout the stream. Canopy closure is less than desirable (55%). Pool frequency is very low (27 channel widths per pool) and average residual pool depth is extremely shallow (0.19 meters). As a result of all of these factors, fish habitat in Wildcat Gulch is in very poor condition.

Murphy Creek is an important fish-bearing tributary to the Applegate River with good potential for producing salmon, steelhead and trout. However, the stream has been substantially affected by irrigation diversions and past manipulation of the stream channel on private land. There are nineteen irrigation diversions located throughout Murphy Creek. As a result, the stream's flow is puddled or dry in the lower ½ mile reach as early as July. Additionally, artificial berms, rip rap, and streambank erosion occurs throughout the lower half-mile of stream channel (Beaumier 1998).

The average stream gradient of Murphy Creek is 1.8%. There are very low amounts of instream wood present. Canopy closure is extremely poor, particularly in the lower reaches. For the last two years (1997 + 1998), the seven-day average maximum stream temperature has exceeded the DEQ standard of 64°F. Pool frequency varies throughout Murphy Creek. In the lower three reaches, the pool frequency is low (16.4 channel widths per pool). However, in the upper reaches the pool frequency is high (6.2 channel widths per pool). Average residual pool depth is low (0.43 meters).

c. Large Woody Material

Streams in the Murphy Watershed typically have the same primary factors limiting salmonid production: In-stream habitat complexity is lacking in large woody debris greater than or equal to 24 inches in diameter with a length which is equal to or greater than the bankfull width; stream shade less than 60%; and lack of mature trees, especially conifers, >32 inches in diameter within 100 feet of the stream.

Large wood is an important if not critical component of stream habitat. It plays a critical part in determining the productivity of the stream. It is an important determinate of stream hydraulics, microsite habitat conditions feeding substrate, and pool and drop creation. The Southwest Oregon Late-Successional Reserve Assessment (USDA / USDI 1995) has listed desirable minimum levels for large woody material after stand-replacement (fire with timber salvage) and non-stand replacement (commercial thinning) events.

d. Macro-Invertebrates

Specifics about macroinvertebrate health within the Murphy Watershed Analysis area are not known. The Applegate River Watershed Council (ARWC) contracted with Aquatic Biology Associates, Inc., to conduct macroinvertebrate surveys at the Cherry Flat area of Murphy Creek. Specimens were collected in the fall of 1999. The findings are not yet available.

e. Special Status Species

The coho salmon (*Oncorhynchus kisutch*) is the only federally listed (threatened) fish within the Murphy Watershed. There are several other special status species present within the watershed whose habitat requirements are the same as those of coho salmon.

Table III - 16 lists Special Status and federally-threatened Aquatic Species inhabiting the Murphy Watershed.

Table III - 16: Special Status and Federally-Listed Aquatic Species

Species	Status
Steelhead	• Federal Candidate in Oregon, sensitive "At Risk" • Oregon Natural Heritage Program* (ONHP) Status List 1 • State of Oregon "vulnerable"
Chinook salmon	• Federally Proposed Threatened (Deferred until Sept. 1999) • Oregon Natural Heritage Program (ONHP) Status List 3 • State of Oregon "critical" • Critical Habitat Proposed
Cutthroat Trout	• Federal Candidate in Oregon and Washington • Oregon Natural Heritage Program (ONHP) Status List 3 • State of Oregon "vulnerable"
Reticulate Sculpin	• Bureau Tracking in Washington
Coho salmon	• Federally Threatened All Stocks South of Cape Blanco • Oregon Natural Heritage Program (ONHP) Status List 1 • State of Oregon "critical"
Pacific lamprey	• Federal category 2 (USDI 1994)

* Oregon Natural Heritage Program (ONHP) Status:
List 1: Taxa that are threatened with extinction or presumed to be extinct throughout their entire range
List 2: Taxa that are threatened with extirpation or presumed to be extirpated from the state of Oregon.
List 3: Species for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range.
List 4: Taxa which are of concern, but are not currently threatened or endangered.

f. Salmonid Distribution

Table III - 17 summarizes salmonid distribution in the watershed.

Table III - 17: Salmonid Distribution Within the Murphy Watershed (in miles)

Stream Name	Resident Trout	Steelhead	Coho Salmon	Chinook Salmon
Board Shanty Creek	1.4	1.0	0	0
Murphy Creek	6.5	4.5	4.5	2.0
Caris Creek	3.0	2.8	0	0
Onion Creek	0.8	0	0	0
Murphy Creek. Tributary	0.2	0.2	0	0
Miners Creek	0.1	0.1	0	0
Rocky Creek	0.1	0	0	0
Oscar Creek	0	0.1	0	0
Case Creek	1.0	0	0	0
Iron Creek	2.0	0.3	0	0
Spencer Creek	0	0	0.4	0
Miller Creek	0.8	0.8	0	0
Grays Creek	3.0	3.0	0.6	0
Applegate River	13.0	13.0	13.0	13.0

Chinook salmon use the mainstem of the Applegate River for spawning. In addition, they spawn in lower Murphy Creek. They spawn in the Applegate and some lower gradient tributaries from September to November. Coho salmon, steelhead, and cutthroat trout use Applegate River tributaries for spawning and rearing. During low water years, steelhead and coho salmon use the Applegate River and larger-than-customarily used tributaries. During the summer the juveniles may leave the smaller tributaries in search of adequate water temperatures and food.

Pacific lamprey (*Lampetra tridentatus*) are anadromous and use Applegate River tributaries for spawning. The juveniles rear in the tributaries until they are ready to migrate to the ocean. Little is known about lampreys in the Rogue basin, although it is assumed their distribution overlaps that of steelhead.

Reticulate sculpin (*Cottus perplexus*) are found throughout the Applegate Watershed. Their range overlaps that of resident trout.

The redside shiner (*Richardsonius balteatus*) is an exotic species that flourishes in the mainstem and Applegate River and in tributaries with characteristically higher temperatures and lower flows than the upstream reaches.

The speckled dace (*Rhinichthys osculus*) is a native fish found within the Murphy Watershed. Its range overlaps that of resident trout.

The Klamath small-scale sucker (*Catostomus rimiculus*) is the only species of sucker found within the Rogue basin. They inhabit the Applegate River and spawn in tributaries in the spring. Little is known about their distribution within the watershed.

g. Fish Passage Barriers

The following streams have significant barriers to fish passage:

Applegate River: The Murphy Dam is located at river mile 12.5 in the town of Murphy. The structure is composed entirely of concrete and has stoplogs to back up the river. There is a vertical slot fishway which provides some fish passage for migrating adults and juveniles. There is also a gravel pushup dam located at river mile 14 on the Applegate River. It is created annually with a bulldozer to serve as an irrigation diversion point.

Murphy Creek: There is a concrete irrigation dam located at river mile three on Murphy Creek. The dam consists of two steps. The first pool is two feet deep with a twenty inch jump. The second pool is eighteen inches deep with a twenty inch jump (Beaumier 1998). The structure's steps are barriers to juvenile fish passage.

Board Shanty Creek: There is a private driveway crossing Board Shanty Creek at river mile 1.2. The five-foot round culvert has a concrete apron located on the downstream end. The apron creates a velocity barrier to migrating juvenile and adult rainbow trout and steelhead.

Caris Creek: Located 0.2 miles above the Miners Creek confluence, there are three-foot jumps created by concrete weirs and culverts. These impede juvenile and adult steelhead and resident trout migration. The York diversion is located at river mile 1.5. This structure is a concrete dam with stoplogs. The ODFW has installed a screen to prevent fish from migrating into the irrigation canal.

Oscar Creek: There is a two-foot diameter corrugated metal pipe (CMP) located on the road crossing at river mile 0.7. However, the structure is a low priority for replacement as fish distribution surveys completed by the ODFW in 1998 revealed that fish presence ends at river mile 0.1.

Onion Creek: Onion Creek enters a man-made pond before entering the Applegate River. This pond effectively blocks upstream anadromous fish migration.

Miners Creek: There are three side-by-side CMPs located on a private road crossing of Miners Creek at river mile 0.1. There is a four and a half foot jump downstream. The culvert is set at a seven percent slope. The structure is a barrier to migrating adult and juvenile steelhead and resident trout.

Miller Creek: There is a four foot tall irrigation dam with stoplogs located at river mile 0.5. If the boards are not removed at each season's end, the structure is a barrier to migrating juvenile and adult steelhead and cutthroat trout.

Rocky Creek: There is a four-foot CMP at the Kubli Road crossing, located near the mouth of Rocky Creek. The ten-foot jump is a barrier to migrating juvenile and adult resident trout.

I. FIRE MANAGEMENT

1. Fundamental Changes to the Natural Fire Regime

The historic fire regime for the watershed has been that of a low-severity regime. This regime is characterized by frequent fires of low intensity. The exclusion of fire occurrence (both natural and prescribed) has led to a shift in the fire regime to an unnatural, high-severity regime where fires are infrequent, usually high intensity, and cause stand replacement. Where natural high-severity fire regimes normally occur (*e.g.,* northern Cascades and Olympic Mountains), fire return intervals are long and usually associated with infrequent weather events such as prolonged drought or east wind, low humidity events and lightning ignition sources. Southern Oregon and the Murphy Watershed have the same weather conditions and topography that created the former low-severity fire regime. The only change in the fire environment has been the fuel conditions created since the removal of frequent fire. This has caused a vegetation shift to dense, overstocked stands of less fire-resistant species, with an increase in dead and down fuels. Simultaneously, a dramatic increase in human ignition sources has occurred. This has created a current condition for large, increasingly destructive, difficult-to-suppress wildfire with the capability to destroy many of the resource value and desirable conditions present in the watershed.

The Sykes-Savage-Nine Mile fire complex of 1987 is an example. This fire burned over 16,000 acres. Nearly 40% of it was high-intensity, stand-replacement fire. The fire burned for over a month.

2. Fuel Hazard, Wildfire Ignition Risk, Values at Risk

The data collected for the watershed for hazard, ignition risk, and values at risk for loss from wildfire are summarized in Tables III-18 through III-21. Ratings are displayed on Maps 12, 13 and 15. Rating classification criteria are summarized in Appendix E.

Hazard, risk, and value at risk are conditions that are used to better understand and plan for potential fire management problems and to identify opportunities to manage the watershed to meet goals, objectives and desired future conditions. Wildfire occurrence can often prevent the successful achievement of short-term and mid-term land management goals and objectives. Stand-replacement wildfire can prevent the development of mature and late-successional forest conditions as well as convert existing mature forests to early seral forests.

a. Fuel Hazard

Table III - 18: Hazard Classification

Ownership	Acres	High Hazard		Moderate Hazard		Low Hazard	
		Acres	% of Ownership Total	Acres	% of Ownership Total	Acres	% of Ownership Total
BLM	17,380	7,202	41%	8,382	48%	1,796	10%
Non-BLM	24,283	11,548	48%	10,620	44%	2,115	9%
All ownerships	41,663	18,750	45%	19,002	46%	3,911	9%

Vegetation and dead and down fuel conditions in the watershed have led to only 4% of the area being in a low hazard condition and to almost half being in a high hazard condition. The primary factor is the result of exclusion of the natural fire process. Forest management practices that did not treat activity fuels or created younger stands have also contributed to the current condition. Currently, 43% of the watershed is in Mid to Mature vegetative conditions.

b. Wildfire Ignition Risk

Risk is defined as the source of ignition. Seventy percent of the watershed is a high risk category with only 6% in a low risk category. Human presence and use within the watershed produces high risk for wildfire occurrence. Table III-19 summarizes the acres in each risk class.

Table III - 19: Risk Classification

Ownership	Acres	High Risk		Moderate Risk		Low Risk	
		Acres	% of Ownership Total	Acres	% of Ownership Total	Acres	% of Ownership Total
BLM	17,380	8,717	50%	7,576	44%	1,087	6%
Non-BLM	24,283	20,428	84%	2,544	10%	1,311	5%
All Ownerships	41,663	29,145	70%	10,120	24%	2,398	6%

c. Values at Risk

Values at risk are the resource and human values for components of the watershed. Property and resources are the bases for value. Known special status plant sites are included, as are known sites for special status animals. The watershed has over half of its area in the high category for values. This is due largely to the amount of private land, especially residential areas, and the high wildlife, recreational, and other forest resource values found within the watershed, both inside the LSR and elsewhere. Table III-20 summarizes the values at risk classification in the watershed.

Table III - 20: Values at Risk Classification

Ownership	Total Acres	High Values at Risk		Moderate Values at Risk		Low Values at Risk	
		Acres	% of Ownership Total	Acres	% of Ownership Total	Acres	% of Ownership Total
BLM	17,380	7,833	45%	5,779	33%	3,768	22%
Non-BLM	24,283	16,086	66%	4,829	20%	3,368	14%
All Ownerships	41,663	23,919	57%	10,608	25%	7,136	17%

d. Areas of High Hazard, Risk, and Value at Risk

Table III - 21: Areas of High Rating in Hazard, Risk, and Values at Risk Classification

Ownership	Acres	High Ratings in All Three Categories Hazard, Risk, Values at Risk	
		Acres	% of Ownership Total
BLM	17,380	1,062	6%
Non-BLM	24,283	7,830	32%
All Ownerships	41,663	8,892	21%

The Murphy Watershed has nearly 20% of the area with a rating of high for all three factors. These are the areas that have a priority for management review and action to reduce the hazard. The large amount of land with high values at risk and the high level of risk of wildfire occurrence demonstrated the urgent need for management actions and activities that will decrease the potential for large stand-replacement wildfire and loss of important features in the watershed.

J. HUMAN USE

1. Socioeconomic Overview

Current human use of the watershed includes, but is not limited to, tourism, forest product harvesting, mining, ranching and agriculture, rural home sites, and dispersed recreation.

The primary residents include retirees, rural residents who commute between their residence and work in Grants Pass and Medford, small business owners, ranchers, and those engaged in nonranch agriculture and farming. The population is increasing steadily.

In the Murphy area, little economic base remains in the face of declining timber harvest. Although the people living in the northern Murphy area still relate to Murphy, they recognize that increasingly they are a suburb of Grants Pass. The community still has the feel of a blue collar area, as evidenced by the strong vocational trade program at Hidden Valley High School, the focus of which is an immediate occupation. However, retirement, commuting, numerous small-scale trade and service businesses and a preponderance of "lone eagles" make up the economy. (Priester 1994)

The Applegate River dissects the watershed, running east to west. The Applegate River is tributary to the Rogue River with the confluence approximately six miles west of the watershed. The town of Murphy is located in the central portion of the watershed. Murphy is incorporated and includes stores, restaurants, small businesses, and rural residences. Hidden Valley High School is located within the watershed. The majority of the other rural residential areas within the watershed are located in the northern part of the watershed in the New Hope Road area. Residences are also located along Southside Road, Highway 238, North Applegate Road, and Williams Highway north to Grants Pass.

2. Recreation

a. Dispersed Recreation

Dispersed recreation includes off-highway vehicle use, hunting, mountain biking, hiking, horseback riding and driving for pleasure. There is one potential recreation site listed in the Medford District RMP within the watershed. The Round Top Mountain CCC Trail is an historic trail that crosses section 3 and travels north into section 33 to Round Top Mountain. The exact location and status of the trail is unknown. This area and the Munger's Butte area provide some federal block ownership that could facilitate some construction of longer distance trail systems. Winter recreational opportunities include cross country skiing on BLM roads in the higher elevations in the Munger's Butte area.

3. Roads

Most roads in the Murphy Watershed have been constructed as a result of the public's need for access. Many of these roads are on private lands, are natural surfaced and lack appropriate drainage structures. The midslope and low-elevation natural-surfaced roads are a source of erosion and sedimentation of streams.

Road construction and improvement across BLM lands stemmed primarily from timber management objectives and mandates. Many natural-surfaced roads remained open for administrative access after timber sales were completed. These roads are known to be a source of erosion into and sedimentation of streams. BLM roads are managed and inventoried for potential decommissioning or improvements to help reduce sedimentation of neighboring streams.

Prior to 1992, road drainage culverts in the Murphy Watershed were designed for a 25 to 50 year flood event or were sized based on channel width and stream flow. Culvert designs did not consider native and anadromous fish and concentrated water flow through many of these structures was too great to allow many fish from moving upstream. Scour at the exit of these structures created pools and over time drops developed which restricted all movement of fish beyond these points and greatly reduced spawning habitat. Today's culverts are designed for a 100-year flood event and to assure passage of native and anadromous fish. During road inventories, existing culverts are evaluated for future replacement to meet the 100-year flood event.

Road density and type vary in the watershed. Table III-22 summarizes road mileage based on different surface types. The overall average road density on non-BLM land in the watershed is 5.37 miles per square mile. The average density on BLM land is 1.80 miles per square mile. The BLM continues to analyze and inventory BLM-controlled roads in an attempt to improve the roads and reduce road density to a level appropriate for land management and the environment.

Table III - 22: Summary of Road Mileage by Surface Type

Road Ownership	**Surface Type**	**Miles**	**% of total**
BLM	**Natural (NAT)**	**21.41**	**6%**
BLM	Pit Run Rock (PRR)	5.72	2%
BLM	Grid Rolled Rock (GRR)	1.85	1%
BLM	Aggregate Base Coarse (ABC)	6.32	2%
BLM	Aggregate Surface Coarse (ASC)	13.64	4%
BLM	Bituminous Surface Treatment (BST)	0	0%
Private & Other Agencies	Unknown / Various Types (UNK)	301.00	86%
	Total Road Miles	**349.94**	

4. Minerals and Mining

a. Minerals

An inventory, utilizing the mining claim microfiche prepared by the BLM Oregon State Office, shows that there are several mining claims currently existing within the watershed. There is a fairly even mix of lode claims and placer claims.

On the lands administered by the BLM three levels of operations may occur. The level of operation causing the least impact is defined as casual use. Casual use operations include those operations that result in only negligible surface disturbance. These types of operations generally involve no use of mechanized equipment or explosives, no timber cutting, and not include residential occupancy. The miner is not required to notify the BLM of proposed casual use activities. In addition, no administrative review of these types of operations is required. The number of casual users in this category is not known.

The most common level of mining operations involve activities above casual use in an area less than five acres. This level of operations requires the operator to file a mining notice pursuant to the BLM Surface Management Regulations. The mining notice informs the Authorized Officer of the level of operations that will occur, the type of existing disturbance at the location of the operations, the type of equipment to be used in the mining operations, and reclamation plans to be utilized during and after the completion of the mining activities.

An administrative review of mining notices is done to determine if unnecessary or undue degradation may occur as a result of the mining operations. If it appears that unnecessary and undue degradation would occur, the proponent is asked to modify his plans to ensure that unnecessary and undue degradation would not occur. A mining notice is not considered a federal action and no review as outlined by the National Environmental Policy Act is completed. There are approximately one half dozen mining notices that have been submitted for operations proposed to occur on the BLM-administered lands within the watershed.

A plan of operations will be required for mining operations that meet any of the following criteria:

- Proposed operations that may exceed a surface disturbance level of five acres;

- Activities above casual use in specially designated areas such as areas of critical environmental concern (ACEC), lands within an area designated as a Wild or Scenic River, and areas closed to off-highway vehicle use; and

- Activities that are proposed by an operator who, regardless of the level of operations, has been placed in noncompliance for causing unnecessary or undue degradation.

The review of plans of operations involves a NEPA environmental review to be completed no later than 90 days from the date of the submission of the plan. No plans of operations exist within the watershed at this time.

In addition to federal laws, mining claimants must comply with state laws and regulations. These are administered by:

- The Oregon State Department of Environmental Quality monitors and permits dredging activities and activities where settling ponds are used.

- The Oregon Department of Geology and Mineral Industries (DOGAMI) permits all activities over one acre in size or with a total of 5,000 cubic yards of material moved annually. This permit ensures reclamation is completed in a timely manner. DOGAMI requires reclamation bonds where applicable.

- The Department of State Lands permits in-stream activities where the removal, or displacement, of 50 cubic yards of material is anticipated and where the movement of a stream channel is planned.

- The Oregon Department of Fish and Wildlife (ODFW) monitors turbid discharges from mined sites. The ODFW also recommends preferred dredging periods for operations within anadromous fish-bearing streams. The ODFW also approves variances for operations outside the preferred work periods where applicable. The preferred work period on applicable streams within this watershed is between June 15 and September 15 annually. Panning is also allowed year-round.

If mining claim uses, including occupancy, are proposed by the operator / claimant those uses are reviewed by the Authorized Officer. Those uses must be determined to be reasonably incident to mining. Following the determination that the uses are reasonably incident to mining those uses are further analyzed through the NEPA process. That analysis will outline mitigation to minimize or eliminate the environmental impacts of those uses that are authorized. Mining claim uses reasonably incident to mining may only occur after written permission is issued by the Authorized Officer.

b. Surface Uses of a Mining Claim

In some instances the surface of a mining claim is managed by the claimant. These are usually claims that were filed before August 1955 and determined valid at that time. The claimants in these cases have the right to eliminate public access across the area on which they have surface rights. There are no instances within the watershed where the claimants have surface rights. The rights of mining claimants for activities on unpatented claims are outlined in Appendix B.

c. Mineral Potential

Mineral potential is characterized in the Medford District RMP (Chapter 3, p. 102) as low, moderate or high (USDI-BLM 1994). The mineral potential maps (Map 11) shows there is generally a medium potential for gold in mid- to higher-elevation lands north of the Applegate River. The remainder of the watershed has a low potential for minerals.

d. Physical Condition Resulting from Past Mining Activities

The existing physical condition of areas that have been mined is variable. Those areas mined along the Applegate appear to be in satisfactory condition; however, short-term visual impacts occur where dredging undermines the shoreline.

5. Cultural Resources

There are some recorded cultural sites within the watershed. Those sites exist in the foothills primarily north of the Applegate River. Most are related to historic mining. There are some prehistoric sites recorded there as well.

Within the watershed many areas have been surveyed in the past as a part of forest management project planning (*e.g.*, timber sales, road construction).

6. Lands / Realty

The BLM land ownership pattern in the watershed is mostly a scattered mosaic. In general, the land patterns have been molded by the alternate section pattern of O&C railroad revestment and, more recently, by the transfer of public lands from the United States to private ownership through several different Congressional acts. This created a pattern of federal lands administered by the BLM scattered across the watershed and to which access is, in some cases, nonexistent. This also leaves the private land owners with access problems and needs that entail rights-of-way across BLM-administered lands.

Rights-of-way issued to private land owners are for such uses as roads, water systems, power lines, phone lines, and communication sites. The actual locations of these rights-of-way can be found in master title plats kept at the Medford District BLM office.

There are several mineral and land withdrawals within the watershed. The Medford District RMP lists those withdrawals. Most of the withdrawals are for water power sites. There is an existing withdrawal on BLM lands at the Provolt seed orchard. The withdrawal closes the area to mineral entry.

7. Illegal Dumping

Illegal dumping occurs throughout the watershed. Some measures such as road gating and blocking have deterred dumping and may be important long-term measures for eliminating this problem.

IV. REFERENCE CONDITION

A. PURPOSE

The purposes of this section are to assess how ecological conditions have changed over time as the result of human influence and natural disturbances, and to develop a reference for comparison with current conditions and with key management plan objectives (Federal Guide for Watershed Analysis, version 2.2, 1995).

B. CLIMATE

The climate of southwestern Oregon has not been static. During the Holocene (the past 10,000 years), shifts in temperature and precipitation have affected the type and extent of vegetation, the viability of stream and river flows, fish and animal populations, and human access to higher elevations. At the beginning of the Holocene temperatures were rising and the climate was warmer and drier than today. This trend continued until sometime after 6,000 years ago when wetter and cooler conditions began to prevail. During the past few thousand years modern climate and vegetative patterns have prevailed. However, during this latter period the environmental forces have not been constant. Fluctuating cycles of drier and wetter conditions, varying in duration, characterize the modern climatic pattern (Atwood and Grey 1996).

This long period of drier and warmer conditions in southwestern Oregon began to change at some point in the mid Holocene. The onset of wetter, cooler conditions gradually changed vegetation patterns, as well as the quantity and distribution of game animals and migrating fish (Atwood and Grey 1996).

C. EROSION PROCESSES

Prior to Euro-American settlement there were more mature forests with openings caused by native American burning practices and natural lightning events. Vegetation, coarse woody debris, and organic matter on the forest floor protected the soil from erosion.

The historic erosion processes were generally the same as those described under the Current Conditions section. Native people probably did not accelerate the rate of movement by their burning practices because they did not burn on very steep slopes. Native burning practices generally involved burning near level to gently sloping areas in valley bottoms, footslopes and upland meadows. Their fires were spotty and designed to enhance habitats and thus increase numbers of desirable plant and animal species (BLM, Internal Document, 3/13/97). The referenced document refers to conditions in southwestern Oregon with specific application to the Grave Creek Watershed. A cursory review of General Land Office (GLO) maps and notes published in the 1850's and 1991 aerial photos indicate that these types of practices did take place. Frequent burning by the native people at low elevations created park-like forests of scattered trees not typical of the dense forests we see today (Pullen 1996). The practice of fire suppression began in 1903 (McKinley and Frank 1996).

Concentrated flow (gully and rill) erosion occurred mainly in draws where channels were created. The density of these channels varied with climatic cycles. During wet cycles the intermittent stream channels were more common. During dry cycles, cobbles, gravel, and plant debris accumulated in the draws burying the channel (USDI-BLM, Jumpoff Joe WSA 1997). According to Pullen (1996), the native Americans recognized the value of riparian areas for humans and animals and therefore did not burn within them. Furthermore, the riparian areas of Class I, II, III and sometimes IV streams are very moist due to the stream influence and do not burn as easily as the uplands.

Mass movement or slides may have occurred in areas with Manita or other deep, fine-textured soils. Granitic erosion may occur in areas of Siskiyou soils. Acceleration of mass movement can be caused by a reduction of root strength or an increase in moisture content, a result of decreased transpiration. It is doubtful native people's land management practices affected the rates of mass movement. The native people's burning practices had their greatest effects on shallow-rooted plants that rapidly regenerated. Plants with the greatest root strength at depth were negligibly affected by burning.

Native people created foot trails instead of roads. These narrow foot trails had very little effect on erosion, water quality or water quantity. In the 1850's, with the settlement of the area for mining and later farming, trails and wagon roads were beginning to be constructed. With increased roads came increased erosion from ditch line erosion and cutbank and fill failures. In the early 1900's a seventeen ton machine known as “The Beast” was used to haul lumber over roads; it damaged both bridges and culverts (Booth 1984) and compacted the soils considerably.

D. HYDROLOGY

1. Floods

Periodic flooding within the Rogue River Basin has had devastating consequences for the cultural environment. River flows were high enough during major flood years to destroy bridges, roads, buildings, and mining structures, and to inundate agricultural lands and stream courses. The December, 1861 flood destroyed improvements and crops along the Applegate River (Atwood and Grey 1996). The flood of 1890 wiped out almost all of the barns and houses along the Rogue River including the Applegate River (Atwood and Grey 1996). No written record exists of flood impact on human improvements, soil vegetation, or aquatic life before Euro-American settlement and development, although certainly catastrophic one-hundred year floods occurred then, as in the recent past (Atwood and Grey 1996).

Warm rain on snow events have occurred throughout the Euro-American history of the Rogue River and its tributaries. These events have resulted in increased flooding (Hill 1976). An article in the Rogue River Courier, dated January 29, 1903, stated that since Euro-American settlement in this area in the 1850's, there had been floods in 1853, 1861, 1862, 1866, 1881 and 1890. All of these, except for the flood of 1890 which was a rain event, were caused by rain on snow events. Warm rain on snow events have historically been a large factor in flooding in the Murphy Watershed.

Major floods of record in the 1900's occurred in 1927, 1955, 1964, and 1974 (Atwood and Grey 1996). Another major flood occurred in 1997. In the flood of 1927, the Rogue River was swept clear of every bridge between Grants Pass and the Pacific Ocean (Rogue River Courier, March 4, 1927).

2. Droughts

Drought conditions were noted in 1841, 1864, 1869-74, 1882-85, 1889, 1892, 1902, 1905, 1910, 1914-17, 1928-35, 1946-47, 1949, 1959, 1967-68, 1985-88, 1990-92, and 1994 (LaLande 1995). During the drought years, many of the smaller streams in the area went dry and the larger streams had low flow. The affect of droughts was intensified by high water usage for agriculture and mining. The controversy over who should have primary access to the limited water supply (farmers or miners) was described in an 1861 editorial (McKinley and Frank 1996).

3. Dams

Beaver dams were prevalent on the Applegate River system before Euro-American influence. Between 1827 and 1850 fur traders removed virtually all of the beaver from the Applegate River valley (Atwood and Gray 1996). Consequently, the dams were no longer maintained and were destroyed over time. Beaver dams added woody material to streams, trapped and stored fine sediments, and reduced water velocities. The loss of beaver dams likely resulted in scouring of channel beds and banks, increased width / depth ratios, and fine sediment deposition in pools (USDI-BLM, Applegate Star-Boaz WSA 1997).

In the 1970's, the Applegate River, which is several river miles upstream of the Murphy Watershed, was constructed for flood control (Atwood and Grey 1996). This dam severely altered the natural flow regime of the river which is winter flooding and summer droughts.

4. Mining Effects

Gold mining began in the Murphy Watershed in the 1850's. The earliest activity was concentrated in the Applegate River and Murphy Creek and other creeks in the Applegate area upstream of the Murphy Watershed (McKinley and Frank 1996). Placer mining increased sediment in the streams and altered the riparian ecosystem. The introduction of hydraulic technologies in the late 1800's took a huge toll on the riparian environment stream beds were literally torn apart. Hydraulic mining occurred in Oscar Creek and in areas upstream of the Murphy Watershed (McKinley and Frank 1996). The hydraulic boom was recharged in 1899 when operations became fewer, more localized and larger (McKinley and Frank 1996). Dredging, which had the most negative impact on streams, began in Oscar Creek in 1903 (McKinley and Frank 1996). Hydraulic mining results in increased entrenchment, lower sinuosity, and increased sediment loads that fill pools with fine sediment (USDI-BLM, Applegate Star-Boaz WSA 1997).

E. STREAM CHANNEL

Prior to Euro-American settlement, the steeper, headwater streams in the Murphy Watershed had adequate amounts of coarse woody debris to create a step / pool profile. Forests along the streams provided shade and an abundant source of coarse woody debris resulting from tree mortality. The coarse woody debris provided both structure and nutrients for the stream. The Applegate River and its tributaries were more sinuous than they are today. Therefore, the streams were longer, more complex, and provided more aquatic habitat. Beaver eradication, mining, and agricultural development all resulted in increased channelization and decreased sinuosity. When clearing for pastures and fields, numerous sloughs, bayous, overflows, and springs in the Murphy Watershed were channelized to increase the size of fields and pastures (McKinley and Frank 1996). Marsh communities were so effectively altered that now their locations are unidentifiable (McKinley and Frank 1996). Decreased sinuosity from mining and agriculture has resulted in decreased surface area of the streams and decreased groundwater recharge.

F. WATER QUALITY

Overall, prior to Euro-American settlement, historic summer water temperatures were likely lower than today due to lower width-depth ratios and more riparian vegetation. Given the fire occurrence prior to 1920 some stream reaches could have been sparsely vegetated for periods of time, resulting in higher water temperatures during that time (USDI-BLM 1997).

Agriculture and mining in the late 1800's and early 1900's resulted in a reduction in riparian vegetation which allowed more solar radiation to reach the streams. Increased water temperatures resulted from this activity. Irrigation withdrawals lowered stream flows and increased the surface area of the water receiving solar radiation. This also increased stream temperatures.

Sediment loads and turbidity levels were historically lower due to fewer sediment sources prior to Euro-American influences. Sedimentation and turbidity rose dramatically in conjunction with hydraulic mining, land clearing, road building, and settlement along the Applegate River and its tributaries.

G. VEGETATION

In this discussion, the historic vegetation patterns, or reference condition, refers to the forests or vegetation that existed on a site prior to significant Euro-American modification. Examples of significant Euro-American modification include clearing for settlement and agriculture, human development (*e.g.*, homes, buildings, roads) timber harvesting, mining, grazing, and fire suppression.

The best source for constructing a characterization of past vegetation is the O&C revestment notes which include inventory information. The inventories were done to determine the economic worth of the land at that time, how much timber volume was present, and how the land should be used.

Every 40-acre parcel of O&C land was surveyed. Although some of the notes are hard to read, one may draw some conclusions about how the general landscape looked circa 1920.

Enough information is present in the old surveys to develop an approximate major plant series map. The information in the survey notes describes the conifers present in both the overstory and understory, the amount of board feet present at that time, the major hardwood species (madrone, oak, etc.), the dominant brush species such as ceanothus and manzanita, and whether or not there were any recent signs of fire events.

Historic Information was taken from the available data for the majority of BLM lands.

Table IV - 1 summarizes the historic major plant series within the Murphy Watershed and gives an idea about the past vegetation in the Murphy Watershed. This data is based on the 1920 revestment notes and cruise and is not meant to provide exact acreage totals by series or mature / late-successional habitat, or for fire events that existed at that time. In interpreting the notes, an average of 10 MBF / acre for each 40-acre area was used to index the lower end of mature / late-successional forest habitat. This is done for two reasons: to show the amount of high-volume acres in the Murphy Watershed in 1920 and 1922 and to give an estimate of suitable habitat for late-successional dependent species. It should be kept in mind that the cruise data from the 1920 notes are based on different methods and standards than those used today and the volume yield estimate is a conservative estimate by today's standards (Harris 1984).

Table IV - 1: Historic Major Plant Series within Murphy Watershed - Circa 1920

Major Plant Series	# Acres Surveyed	Percent Acres Surveyed	Estimated Acres Burned	Percent BLM Acres Burned, by Series	Estimated Acres of Mature / Old-Growth Forest	Percent, by Series, for Lands Surveyed
Douglas-fir	5,600	35%	2,120	38%	1,560	28%
Jeffrey Pine*	440	3%	0	0%	0	0%
Non-Timber	4,000	25%	240	6%	0	0%
Ponderosa Pine	5,280	33%	80	2%	0	0%
White Oak	600**	4%	200	33%	0	0%
Totals	15,920		2,640		1,560	28%

* Due to the unique nature of Jeffrey pine sites, the actual acre figures for this series are considered to be lower than indicated. These sites may be represented in the revestment notes as Non-Timber or Ponderosa Pine. The 1997 inventory is a more accurate representation of the amount of land with the Jeffrey pine series present.

** White oak is mentioned in the stand descriptive remarks of 40-acre parcels 129 times. White oak representation is found in all other plant series descriptions.

A major plant series is an aggregation of plant associations with the same climax species dominant(s). The Jeffrey pine series, for example, consists of plant associations in which Jeffrey pine is the climax dominant. It defines the potential natural vegetation that would exist on the site at the climax stage of plant succession, (i.e., the end point) where neither the plant composition nor stand structure changes.

Recorded fire events took place at higher elevations, midslope to ridge, in the southern half of the watershed. There is a remarkable absence in the 1916 notes of any mention of fire occurrence in the northern half of the watershed.

A majority of the Ponderosa pine series was in the low-elevation areas which are now farm lands or undergoing rural residential development. These sites occurred primarily in the northern portion of the watershed.

White oak and pine dominance have traded places on ridge lines and on low-site productive land. White oak areas are now classified as pine and Douglas-fir series, or as non-timber.

The Douglas-fir series primarily occurs in the southern half of the watershed on the more northerly exposures in the Murphy Creek, Spencer Creek, Jackson Creek subwatersheds. It also occurs in riparian areas and at mid and upper elevations in the northern half of the watershed. There was also some Douglas-fir found in the surrounding areas that are now farm lands and rural developments.

H. SPECIES AND HABITATS

1. Terrestrial

a. Special Status Plants

It can be postulated that the habitat for late-successional Survey and Manage vascular species (the *Cypripedium* sps. and *Allotropa virgata)* in the Murphy Watershed was once more extensive, at least on north-facing slopes. The habitat may have been similar to that found in the Iron Creek ACEC. The south-facing aspects in the northern part of the watershed were probably always limited in the extent of moister, late-successional habitat. The microhabitat required was most likely more abundant and contiguous before timber harvest was common, with frequent, low-intensity fires helping to maintain a competitive edge for these species in the herbaceous layer. Due to the complex life history of these plants, they were probably never a dominant species in the herbaceous layer, but they could have occurred more frequently in the watershed and with higher numbers of plants per population area if moister, shaded microsite conditions occurred more frequently.

Since serpentine habitats occur because of unusual soils, their area was probably similar to and contained the same type of plants, as today but at higher levels of diversity. The low-intensity, more frequent fires of the past probably helped to promote this higher species diversity. These areas were also probably more extensive in size because the fires prevented encroachment of trees and shrubs.

Oak woodlands and grasslands above the valley floor may also have been healthier due to frequent, low- intensity fires. Therefore, better habitat may have been available for the rare lichens that have been found.

Noxious weeds were nonexistent before the advent of European settlers. Yellow star thistle would not have been a problem since little valley habitat would have been disturbed for agriculture. Native vegetation and habitats would have been more intact in the Applegate Valley.

b. Wildlife

A pre-Euro-American view of the Murphy Watershed would be dramatically different than one would see today. Native Americans were managing the landscape for habitats and products they found useful. Fires were used to burn off undesirable vegetation and to promote production of desired products. Wildlife was extensively used by these people to meet their everyday needs. Human exploitation of these wildlife resources was at a sustainable level. Each species maintained its role in an intricate food chain, where its presence benefitted the community as a whole. Large predator species such as grizzly bears *(Ursus horribilis)*, and wolves *(Canis lupus)* were present in the watershed (Bailey 1936) and, along with cougar *(Felis concolor)* and black bear *(Ursus americanus)* maintained the balance of species such as Roosevelt elk *(Cervus elaphus)* and blacktailed deer *(Odocoileus hemionus)*. Predator species helped maintain a balance between herbivorous species and vegetation. Predator species also benefitted other community members like ground nesting birds. They consumed small mammals such as raccoons *(Procyon lotor)* that fed on the young birds. Predators also made carcasses available in the winter that benefitted species as diverse as the striped skunk *(Mephitis mephitis)* and the black-capped chickadee *(Parus atricapillus)*.

The landscape was open and the movement of animals was unrestricted. Many animals migrated with the seasons to take advantage of food, shelter and water. Black bears in the early spring sought green grass to activate their digestive system. Winter kills that remained were utilized by the bears at this time. In early summer, California ground-cone *(Boschniakia spp.)* was an important part of their diet, until berries became available. As fall approached, the salmon returned to the river, spawned and died. This abundant food source was available to a host of consumers and scavengers. Deer and elk also followed the seasons. Winter was primarily spent in the oak savannahs. As the seasons progressed they would enter the uplands until fall arrived. Other species, such as the wolverine *(Gulo gulo luteus)* remained in the high elevations throughout the year. This species was an opportunistic predator, feeding on animals such as porcupines *(Erithizon dorsatum)* and on occasional winter kills.

Historically, the valley floor was dominated by an open stand of large conifers and oak grasslands kept free of brush by fire. Maps produced between 1856 and 1894 by the General Land Office characterize this area as "surface hilly with open Pine, Fir, Cedar and Oak timber." This habitat provided nesting areas for various species, mast crops of acorns for wildlife forage, and big game winter range. A variety of bird species such as the acorn woodpecker *(Melanerpes formicivorus)*, western blue bird *(Sialia mexicana)* and Lewis' woodpecker *(Melanerpes lewis)* were intricately tied to these stands. Species such as the sharptailed snake *(Contia tenuis)*, the common kingsnake *(Lampropeltis getulus)*, and the mountain kingsnake *(Lampropeltis zonata)* used the grassland-riparian interface area as their primary habitat. The open condition and the grass were highly beneficial to a number of game animals and ground nesting birds. Deer and elk used this area for winter range. In turn, game animals provided sustenance for a number of predator species. Grey foxes *(Urocyon cinereoargenteus)* used the valley and nearby brushy slopes as their primary habitat. The area found above the valley floor was dominated by conifers. Stages of stand development varied due to disturbance events such as fire. Forests found on north- and east-facing slopes were generally multicanopied, with large number of snags, down wood, and large trees. South and west facing aspects were occupied by stands with a higher fire return interval, and were often devoid of large amounts of down woody material. The amount of old-growth forest historically found in the watershed varied through time in response to disturbance events. Old-growth / mature forest was the dominant forest type in southwestern Oregon prior to Euro-American settlement, occupying as much as 71% of the area. (Ripple 1994). The Murphy Watershed would be below this level due to its primary southerly aspect.

Species that benefitted from these forests, such as the pileated woodpeckers *(Dryocopus pileatus)*, northern flying squirrel *(Glaucomys sabrinus)* and red tree vole *(Phenacomys longicaudus),* were found in greater numbers than they are now. Dispersal of animals, recolonization of former habitats, and pioneering into unoccupied territories was accomplished more effectively than it is today due to the connectivity of the older forest. Ripple (1994) estimated that 89% of the forest in the large-size class was in one large, connected patch extending throughout most of western Oregon. Due to the connectivity of mature habitat, species that benefitted from edge environments, such as striped skunks *(Mephitis mephitis),* were less common than they are today.

Snags were more numerous than they are today and species that use snags as their primary habitat were more common. Numerous disturbance events such as fire, windthrow, and insect infestations played important roles in snag production. Due to the greater habitat, species that use snags were more common than they are today. Species such as the northern pygmy owl *(Glaucidium gnoma)*, western screech owl *(Otus asio),* and northern flicker *(Colaptes auratus)* had more habitat than is currently available.

c. Riparian

Prior to the European settlement of the valley, pristine streams flowed from their source to the Applegate River. Water quality was extremely high. Seeps, springs, snow, and riparian vegetation all contributed to keeping the water cool. During the winter and spring, occasional floods would flush the system clear of sediment deposited by natural slides and erosion. Stream courses in uplands were primarily lined by conifers and a narrow band of deciduous trees, and were well defined by entrenched channels. As the streams dropped to the valley floor, wide floodplains were developed and the streams meandered, taking on a variety of courses from year to year. These highly sinuous stream systems consisted of undercut banks, oxbows, and woody material that created a diverse aquatic system and associated habitats. The riparian zone would have been wider, with deciduous trees playing a more important role than in the uplands. Due to higher humidity, conifers near the streams resisted burning, allowing them to mature and resulting in heavy loading of large woody debris in the water. Adding to the diversity was a myriad of wildlife species. Beavers *(Castor canadensis)* acted as a keystone species creating backwater sloughs behind their dams, and adding finer woody material to the stream. This fine material benefitted fish, providing them with cover. Species such as ducks and geese also benefitted from the creation of ponds that provide nesting habitat. The diversity of wildlife species was not restricted to the surface, as a profusion of aquatic insects took advantage of the variety of available niches. These insects in turn supported an assortment of vertebrate species including anadromous fish. As the adult fish returned to their native streams, their carcasses produced a rich source of food that, in turn, supported minks *(Mustela vision)*, American black bears *(Ursus americanus)*, grizzly bears *(Ursus horribilis)*, bald eagles *(Haliaeetus leucocephalus)* and a number of other scavenger species.

2. Aquatic

a. Fisheries

Pre-Euro-American Settlement: A pre-Euro-American view of the Murphy Watershed would have included robust populations of beaver and salmon, particularly in the lower and middle reaches of Murphy Creek. In addition, there would have been a mixture of mature conifers and hardwoods and riparian zones with dense canopies. Summer water temperature as probably cool and not a limiting factor in salmonid production. There would have been large woody debris dispersed throughout the streams providing complex habitats for resident trout, juvenile steelhead and salmon. There probably would have been abundance of fish in most streams. Native Americans relied heavily on salmon, steelhead, lamprey and suckers for subsistence and ceremonial purposes.

Prior to Euro-American settlement, streams meandered with unconstrained channels. Multiple stream channels dissipated flows and created fish habitat. Riparian vegetation and trees up took heavy winter rains, limiting the effects of annual peak flows. Winter scour did not limit macroinvertebrate and fish populations. In addition, large riparian downed wood held back spawning gravels during high flow events in some of the watershed's steeper gradient streams. Sediment in the spawning gravels was not limiting to fish or macroinvertebrate populations. Occasionally, landslides would deliver sediment to streams. However, large wood almost always accompanied the sediment delivery. The wood controlled sediment movement throughout the system and the sediment did not embed itself into the spawning gravel.

Post-Euro-American Settlement: Euro-Americans trapped beaver extensively, and as a result complex, deep pools started disappearing throughout the watershed. Coho salmon populations began declining. In addition, mining roads and other travel ways began more numerous. This led to an increase in peak winter flows, especially when roads were located near streams. Sedimentation of streams increased as well. Placer mining caused extensive erosion of the streambanks. Placer mines were found in Oscar Creek, Carris Creek, Miners Creek, Miller Creek, Rocky Gulch, Board Shanty Creek, Grays Creek, and Murphy Creek. Mining occurred throughout the Rogue basin. Extensive mining in the early 1900's caused the Rogue River to run brick red with silt (ODFW 1994). Stream sedimentation contributed to a decline in salmonid populations throughout the Murphy Watershed.

There was extensive agricultural activity within the Murphy Watershed Analysis area. Fields were plowed right up to the streambanks. Trees and other riparian vegetation were removed, thereby reducing stream shade. In addition, agricultural runoff added excess sediment to streams. Irrigation diversions limited salmonid survival wherever they occurred. Fish screens on irrigation diversions were a relatively new phenomenon and consequently, large numbers of salmon and trout ended up in farmer's fields.

The following (Table IV-2) flow and temperature measurements are indicative of not only the seasonal hydrological cycle of many of the streams within the Murphy Watershed area, but also the impacts of summer irrigation withdrawals.

Table IV - 2: Murphy Creek Flow and Temperature Data (Collected by ODFW)

Date	Time	Air Temp. (°F)	Water Temp. (°F)	Flow (cfs)	Location
5/1/67	11:50	55	47	23	Mile 0.4
6/1/67	11:00	54	53	9.1	"
7/6/67	10:15	77	--	Dry	"
8/30/67	15:15	98	--	Dry	"
10/2/67	13:05	48	--	Dry	"
11/1/67	13:00	55	54	0.8	"

Timber harvest had one of the biggest impacts on juvenile coho salmon, steelhead, and cutthroat trout habitat. Streamside trees were harvested due to their size and value. When the majority of the large wood was removed, there was little available for recruitment for fish habitat. Habitat complexity rapidly declined, as did the coho salmon, steelhead, and cutthroat trout populations which were dependant upon the large wood. Coho salmon were most affected by the loss of large wood, since juvenile coho require complex pools for rearing habitat. In addition, coho are found in lower gradient stream reaches than resident trout and steelhead, and are not distributed as far upstream. As a result, when the lowland habitat was altered, there was limited refugia for the coho salmon.

Road construction increased with timber harvest and this compounded the problem of limited juvenile habitat. Sedimentation increased and began limiting salmonid production. Winter flows began to have higher peaks as a result of the increased surface area of roads. High winter scour limited macroinvertebrate populations and transported wood from streams. Fish habitat declined. In addition, many roads were constructed next to streams. This eliminated stream meander and multiple channels. Peak flows did further damage, as the streams could not naturally diffuse the high energy from flood events.

Commercial salmon harvest further affected the declining salmon runs. Insufficient restrictions on commercial harvest, coupled with a rapid decrease in freshwater habitat, led to a crash in the coho salmon population.

Residents living near Murphy Creek reported many more steelhead and salmon returning 20-30 years ago (Beaumier and Proctor 1998). Additionally, few steelhead have been seen in the last few years despite higher summer stream flows.

I. FIRE

The historic fire regime of the Murphy Watershed was a low-severity one. The low-severity fire regime is characterized by frequent (every 25 years) fires of low intensity (Agee 1990).

Fires in a low-severity regime are associated with ecosystem stability, as the system is more stable in the presence of fire than in its absence (Agee 1990). Frequent, low-severity fires keep sites open so that they are less likely to burn intensely even when there is severe fire weather. Limited overstory mortality occurs. The majority of the dominant overstory trees are adapted to resist low-intensity fires because of thick bark developed at an early age. Structural effects of these fires are on the smaller understory trees and shrubs. These, along with down woody fuels, are periodically removed or thinned by low-intensity fires. The resulting understory density is low, open, and park- like in appearance over a vast majority of the landscape.

With the advent of fire exclusion, the pattern of frequent low-intensity fire ended. Dead and down fuel and understory vegetation are no longer periodically removed. Species composition changes and thinner barked, less fire-resistant species increase in number and percentage of site occupancy. This creates a trend of ever increasing buildup in the amount of live and dead fuel. The understory of stands become dense and choked with conifer and hardwood reproduction. The longer interval between fire occurrence allows both live and dead fuel to buildup. This creates higher intensity, stand-replacement fires rather than the historical low-intensity ground fires that maintained park-like stands.

1. Social Concern - Air Quality

Poor air quality due to natural and prescribed (human) fire has been an historic occurrence in the spring, summer, and fall seasons in southern Oregon. Numerous references are made by early Euro-American explorers and settlers to Native American burning and wildfire occurrence in southern Oregon. Smoke-filled sky and valleys were once typical during the warm seasons. Air quality impacts from natural and prescribed fires declined with active fire suppression and declines in settlement and mining burning. Factors influencing air quality shifted away from wildfire and human burning to fossil fuel combustion as population and industry grew. This created a shift in the season of air quality concern to the winter months when stable air and poor ventilation occur. By the 1970's, fossil fuel emissions have become a major factor along with wood stove and backyard burning. Prescribed burning related to the forest industry increased throughout this period and was an additional factor, particularly in the fall. Regulation of prescribed burning smoke emissions and environmental regulation of fossil fuel combustion sources has lead to a steady improvement in air quality since the 1970's.

The historic fire regime created a pine-dominated forest characterized by having little dead and down ground fuels and few standing snags (*Applegate Adaptive Management Area Ecosystem Health Assessment, 1994*). Upland vegetation had a considerably less dense understory. Coarse down woody accumulations were relatively light. The frequent low-intensity fires consumed the majority of the debris. Less smoke and particulates were produced in the past, as there was less material to burn.

Air quality as a reference condition is determined by legal statutes. The Clean Air Act and the Oregon State Air Quality Implementation Plan have set goals and objectives. Management actions must conform such that any effort is made to meet national ambient air quality standards, prevention of significant deterioration, and meet the Oregon visibility protection plan and smoke management plan goals.

2. Social Concern - Hazardous Fuels Buildup

The reference condition for fuel conditions in the pre-settlement period would have been one of low build-up over the vast majority of areas. Lack of fire suppression and Native American use of fire maintained a comparatively open forest understory with little fuel accumulation or understory vegetative growth. This would have occurred across the watershed with only isolated areas of dense undergrowth and fuel accumulation. These areas would have changed over time. Location would have largely been dependent on the lightning occurrence pattern, with the exception of areas used by Native Americas for food production. The buildup of fuel and vegetation that has resulted from modern human settlement and subsequent fire exclusion has created a hazardous situation that is outside of the reference condition and natural range of variation.

J. HUMAN USES

1. Cultural / Historical Use

Archeological evidence indicates that human occupation of southwest Oregon dates back about 10,000 years. During prehistoric times, the native inhabitants occupied southwest Oregon and minimally affected the physical landscape. The native inhabitants of the area were hunters and gatherers.

The first known Europeans to enter the Rogue Valley passed through in early 1827. They belonged to a party of Hudson's Bay Company trappers from Fort Vancouver under the leadership of Peter Skene Ogden. The Hudson Bay Company trappers continued to visit the area for several years. Other trappers and explorers made periodic visits to the area up to the time of the discovery of gold in Jackson County.

Gold was discovered on Jackson Creek (near present-day Jacksonville) in the Rogue Valley in late 1851 or early 1852. Although gold was previously discovered elsewhere along the Applegate and Illinois Rivers', the Jackson Creek discovery brought an influx of thousands of miners to the region.

As mentioned in the Characterization section, the land ownership pattern of the watershed was primarily established in the late 1800's and early 1900's. The lands in the watershed in the mid-1800's were public lands owned by the United States and administered by the General Land Office. The first primary transfer of public lands out of ownership by the United States was to the state of Oregon following statehood in 1859.

In order to further develop the west, Congress passed several laws enabling settlers to obtain ownership of public lands. These laws included Donation Land Claim patents, entry under the Homestead Acts, military patents, and mineral patents. In addition, land was deeded to the Oregon and California Railroad, with some of those lands being sold to private individuals. In reviewing the master title plats for the Murphy Watershed, it is apparent that ownership of several of the low-elevation lands was originally deeded from the United States to private individuals through the above acts of Congress.

Gold mining began in the watershed in the late 1800's. The majority of the mining appears to have been placer mining, however, there have been several lode (hard rock) mines in operation within the watershed.

The abrupt influx of miners into the Rogue country devastated local Indian bands. Miners were ruthless in their treatment of the Indians. The mining destroyed the river banks and way of life of the Indians. Clashes between the government volunteer forces and Indians occurred between 1851 and 1856. By the spring of 1856 the Indians were defeated and those remaining were taken to reservations elsewhere.

A small number of small placer mining operations were active in the early days along the lower and upper Applegate River. This was especially true on bench gravels adjacent to the main channel.

Creeks within the watershed with significant historic placer mining activity are: Carris, Miners, Miller, Oscar, Rocky, Board Shanty, Grays, and Murphy. The history and production records of these areas is scanty, but one can still see evidence of the early-day mining and a few small seasonal operations that continue in the area. A one-yard diesel shovel was operated on Oscar Creek in 1933 and gravel was transported about one mile from the shovel to a sluice by five-ton trucks.

Although the mining history of the watershed revolves around placer mining there is one hard rock / lode operation of note. That mine was called the Exchequer Mine. This mine was located south of the Applegate River on the north slopes of Pennington Mountain at the 1,250 foot elevation. This mine included underground workings totaling about 1,200 feet on four levels with two shafts and stopes. Approximately 12 acres was subsequently patented.

By 1853 an inland travel route connecting Crescent City, California with southern Oregon was established. This route entered the Applegate River valley from the Illinois River Watershed over Mooney Mountain and down Cheney Creek. The route followed the Applegate River to the townsite of Jacksonville. The most common route through the watershed at that time was along the northside of the Applegate River; however, the route following the Applegate River on the southside also well traveled.

A popular stopping place along the travel route was at the current location of the town of Murphy. By 1855 between 50 and 200 mules a day were packed for the continuance of the trip inland. In 1876 a post office was set up at the old Murphy stage stop. The buildings were located on the bench across the Southside Road from the Murphy Lumber Company mill. Sometime during the 1880's the office was moved about three miles up the Applegate, still on the southside of the river. (Johnson 1989)

2. Roads

Before settlement of the west, ground disturbances were caused by animals and forces of nature. As the west developed, animal trails became narrow roads used to transport people and supplies. These roads were generally naturally surfaced ones with the amount of sediment flow dependent upon use, location, weather conditions, and soil type. As the use of these roads increased over the years, the roads themselves changed in design. Many of today's highways began as trails and are now widened, realigned, and surfaced to meet the increase and change in vehicle traffic. Even with the increase in traffic flow, crushed rock surfacing, asphalt, modern techniques in road stabilization, and improved road drainage have actually decreased sedimentation and erosion along the original natural-surfaced roads.

3. Recreation

During the earliest years of the twentieth century, recreational activity was intertwined with work and food acquisition (Atwood and Grey 1995). The 1930's brought about the Civilian Conservation Corps (CCC) which, among other duties, was responsible for building roads. These new roads provided recreational opportunities that were not previously available to many people. People began using roads to access sites for hiking, camping and driving for pleasure. Other recreational activities included camping, hunting, and horseback riding.

V. SYNTHESIS AND INTERPRETATION

A. PURPOSE

The purposes of the synthesis and interpretation section of the watershed analysis are to compare existing and reference conditions of specific ecosystem elements, to explain significant differences, similarities or trends and their causes, and to assess the capability of the system to net key management plan objectives.

B. EROSIONAL PROCESSES

The major changes between historic reference conditions and current conditions are due to increases in the intensity and the types of human interaction with the environment. Native people's burning practices were limited to valley bottoms, gently sloping footslopes and isolated upland meadows. The fires were spotty. This contrasts strongly with forest management that has occurred since the end of the nineteenth century.

Intensive forest management on both private and public land has included fire suppression, extensive road construction, and heavy logging with yarders on steep slopes and tractors on gentle to moderate slopes. Fire suppression has resulted in accumulation of fuels. When these burn in a wildfire situation, they can burn extensively and with high intensity. The Sykes-Savage-Ninemile Complex fire of 1987, for example, burned over 16,000 acres, nearly 40% of which burned as a high-intensity, stand-replacement fire (see Fuels section, Chapter 3). A high-intensity fire consumes the duff, litter and most of the coarse woody debris. The top layer of mineral soil impacted by a high-intensity fire commonly shows color changes due to consumption of organic matter and the effects of heat on the mineral components.

Hydrologic cumulative effects analyses have not been completed for subwatersheds within the Murphy Watershed. However, estimates based on map and aerial photo interpretation indicate that some areas on private land such as Onion Creek, Gray's Creek and Board Shanty have high road densities. Upper Murphy Creek on BLM land also has a high road density. This is within the Late-Successional Reserve. Road density is considered to be high when it is greater than four miles of road per square mile.

High road densities combined with patch clearcuts, such as have been done in the past in these small watersheds, result in substantial increases in peak flow (Jones 1996). Other effects that may be attributable to high road densities combined with clearcuts are destabilization of stream channels and a reduction in intermediate and low flows.

Mining, particularly in Oscar Creek, has affected erosion processes. Heavy disturbance coupled with diversion of surface flow has created increases in susceptibility to mass movement (slides) and bank erosion. In 1997 a slide occurred where a miner had heavily disturbed a slope.

C. HYDROLOGY

The stream flow regime in the Murphy Watershed reflects human influences that have occurred since European settlers arrived (USDI-BLM 1997). Changes in the stream flow regime due to human disturbance have not been quantified in the Murphy Watershed (USDI-BLM 1997). Changes may include channel widening, bank erosion, channel scouring and increased sediment loads. Stream surveys of many Class 3 and 4 streams still need to be completed.

Road construction, timber harvest, water withdrawals and fire suppression are the major factors having the potential to adversely affect the timing and magnitude of stream flows in portions of the Murphy Watershed. Extensive road building and timber harvest have raised the potential for increasing the magnitude and frequency of peak flows in many tributaries. The magnitude of the effect on the Applegate is small but it is a part of a cumulative effect that includes all the upstream Applegate basin. As the vegetation in harvested areas recovers, the magnitude and frequency of peak flows diminish. Permanent road systems will prevent the stream flow from returning to pre-disturbance levels (USDI-BLM 1997). However, road construction and reconstruction techniques can minimize the long-term effects by spreading runoff so that most is subject to soil infiltration.

Effects of roads vary with road location on the landscape. Roads, particularly those adjacent to streams, have a direct effect on stream flow patterns and water quality. Roads were historically built where the natural gradients made road location and construction easiest, generally in bottoms where stream were located. Added investments for improvements and tributary roads over time would make many these roads nearly permanent in spite of their poor location from a hydrologic and erosion perspective. Examples of such roads are the Murphy , Oscar, Rocky, Caris, and Grays Creek Roads.

D. WATER QUALITY

Changes in water quality and temperature from reference to current conditions that can stress aquatic life are predominantly caused by riparian vegetation removal, water withdrawals and roads. Water quality elements known to be affected the most by human disturbances are temperature, sediment and turbidity. Roads are the primary source of sediment in the analysis area (USDI-BLM 1997).

The recovery of riparian vegetation will provide shade and should bring about the reduction of stream temperatures. Road maintenance (i.e., drainage improvements including surface regrading to outslope wherever possible) and decommissioning would decrease sedimentation in the analysis area (USDI-BLM 1997) .

Water withdrawals are active during the irrigation season on private land. Increased irrigation efficiency would leave more cool water in the stream system and decrease the amount of warm tail water that gets back into the system. This is an issue on private land.

E. STREAM CHANNELS

Channel conditions and sediment transport processes in the Murphy Watershed have changed since Euro-American settlers arrived in the 1830's, primarily as a result of mining, road building and removal of riparian vegetation. Hydraulic mining resulted in entrenched channels with greater width-depth ratios. Increases instream gradients and sediment transport are consequences of the larger width-depth ratios (USDI-BLM 1997).

Sediment is mainly transported from road surfaces, fill slopes, streambanks and ditch lines. Increases in sediment loads due to roads are generally highest during the five-year period after construction. However, roads continue to supply sediment to streams as long as the roads exist. Road maintenance, renovation and decommissioning may in some instances reduce the amount of sediment moving from the roads to the streams. Roads constructed adjacent to stream channels tend to confine the stream and restrict the natural tendency of stream channels to move laterally. This can lead to downcutting of the stream bed and bank erosion. Obliteration of streamside roads would improve the situation (USDI-BLM 1997).

Removal of riparian vegetation has had a major detrimental effect on the presence of large woody debris in the stream channels. There is a minimal amount of large woody debris in the analysis area with many areas lacking the potential for short-term future recruitment. Large woody debris is essential for reducing stream velocities during peak flows and for trapping and slowing the movement of sediment and organic matter through the stream system. It also helps to diversify aquatic habitat. Riparian reserves along intermittent, perennial nonfish-bearing, and fish-bearing streams will provide a long-term source of large woody debris recruitment for streams on federal land once the vegetation has been restored (USDI-BLM 1997). Stream surveys are needed for the Class 3 and 4 streams to quantify where large woody debris is needed.

F. VEGETATION

Two trends in vegetative conditions in the Murphy Watershed are increasing densities of trees and shrubs within stands and a shift from historically-dominant overstory species to species that were found primarily in the understory. In the past, Ponderosa and sugar pine were far more prevalent and often dominated forest stands and oak woodlands dominated dry lowland slopes. Currently, the Douglas-fir series is prevalent on xeric sites.

The vegetative conditions in the watershed today are a result of fire suppression and replacement of the natural disturbance pattern with human disturbances such as logging, farming, mining and rural development. This has generated two areas of concern:

1. Fire suppression has resulted in many of the forests in the watershed reaching densities of trees and shrubs that are not sustainable over time. In addition, fire suppression has shifted Douglas-fir onto what were formerly Ponderosa pine sites, and tanoak and white fir onto what were formerly Douglas-fir sites.

2. Past harvest patterns in the watershed have resulted in removal of economically and biologically valuable tree species such as Ponderosa and sugar pine. Past harvest has also resulted in forest stands with a one to two age or size class.

The vegetative and structural conditions of the forests in the watershed are not constant and have changed frequently in response to historic disturbance patterns. Disturbance has played a vital role in creating diverse vegetative types, structures and densities. Fire, insects, disease, periods of drought and the resultant tree mortality have always been components of ecosystem processes and occurred within a range of natural conditions.

Maintaining vegetative diversity and densities that are sustainable over time are important terrestrial and riparian ecosystem processes. These important processes have been affected by the shift from frequent, low-intensity fire to settlement-related disturbances and fire suppression. When forest density, species composition, structure (variety of tree sizes, presence of snags and large down logs, etc.), populations of insects, presence of disease, incidence of stand-replacement fire events, and tree mortality occur outside the range of natural conditions, components of the ecosystem process are affected. This is the current trend for the Murphy Watershed.

The previous timber harvest patterns in the watershed have tended to simplify forest structures and alter the mix of seral and age class distributions. A high percentage of lands in the watershed exists in small (5-11" DBH) and large (11-21" DBH) pole size classes. This predominance of one size and structure class in a stand is not the same structural diversity found in the reference condition. Nor is it the desired vegetative condition of a diverse landscape pattern of vegetation or what is needed to meet the many values being managed for in the watershed. Similarly, fire suppression has contributed to dense pole stands developing over much of the watershed which are crowding out important but less shade-tolerant mid-seral species such as Ponderosa pine, sugar pine, and California black oak. Stands consisting of dense poles or of small diameter are more vulnerable to stand-replacement wildfire. Fire suppression has also permitted tanoak to become a much more significant stand component than in the reference condition in many areas of the watershed.

Species composition and diversity, relative density, percent live crown ratio, and radial growth are all indicators of how forests can be expected to respond to environmental stresses. As discussed below, when forests remain at unsustainable densities for too long, a number of trends begin to occur that effect stand health.

Forests of the Klamath Mountain Province are known for their rich species diversity. This diversity is an important habitat quality for plants and animals, and diverse forests are much better able to withstand environmental stresses such as drought and insect and disease attacks.

Species such as Ponderosa and sugar pine, California black oak and Pacific madrone have historically been important components of the forests of the Murphy Watershed. These are considered mid-seral species, and to flourish they require the less dense, more open canopy conditions that existed in the forests of the watershed prior to fire suppression. As stand densities increase beyond the range of natural conditions, these species drop out and the forests become dominated by late-seral climax dominants such as Douglas-fir at lower elevations, tanoak at mid-elevation sites and true fir at higher elevations. Forests composed of climax dominant species, as is the trend in the watershed, are more unstable and become increasingly vulnerable to environmental stresses.

The portion of BLM forest land in the watershed that currently exists in a mature / old-growth condition is approximately 5,941 acres (34% of BLM acres) or 14% of the watershed. It is estimated that approximately 30% of the watershed existed in a mature / old- growth condition according to the reference condition.

Mature / old-growth forest for the 1920 surveys was defined as any parcel that exceeded 10,000 board feet per acre in conifers and covered approximately 1,560 acres. There would have been more volume if 1998 volume criteria were applied. For example, in 1920 conifers were cruised only if they were at least 16" DBH and then only to a 12-inch top. Anything less than 16" DBH was considered a pole and not counted as volume. Today's methods of cruising count any conifers greater than 7" DBH and cruise all trees to a 5-inch top. Consequently, by today's standards there was more volume present than listed in the revestment notes. Added to this is a hardwood component which provides structure and canopy layering. For this reason, the 10,000 board foot criterion is used. Natural disturbance history, as well as human impacts from burning and timber harvest play important roles in the amount of old growth existing in the watershed today.

Since 1920, the increase in acreage is due to sites that were classified as non-timber and not all federal lands had historical survey data available. It also reflects the changes on sites primarily classified as Ponderosa pine or white oak series that now have Douglas-fir filling in adding an additional structural component. This component, was not previously present due to the shorter interval between fire disturbances. Repeated low-intensity fires did not allow for the establishment of Douglas-fir at the rate now seen in the watershed.

Percent live crown ratio and radial growth are physiological indicators of a trees' ability to produce food and defensive compounds. Healthy live crowns are essential for healthy trees. When the average live crown ratio in a forest stand drops much below 33%, the crown's ability to support vital processes in the tree becomes diminished. Live crown ratios begin to recede as forests remain in an over-dense condition for too long. When live crown ratios are reduced too far, trees are unable to quickly respond to the release provided by density-management thinning, and partial cutting management prescriptions may no longer be a forest management option.

Similarly, radial growth rate is an indicator of whether trees have sufficient resources to support vital physiological processes. Low production of stem wood per unit of foliage has been associated with a tree's ability to accumulate reserves or to produce defensive compounds. Stem growth only occurs once the resource demands of foliage and root growth have been met. When trees are not able to produce sufficient photosynthate and defensive compounds, they become increasingly vulnerable to insect and disease attacks.

Fire is the primary process in the ecosystem that would lower densities and clear out competing understory vegetation. In the absence of fire, insects and disease often become the agents that reduce stand density. Because of densities in forest stands (live fuels) in the Murphy Watershed, the buildup of dead and down fuels, the checkerboard ownership of private and government lands and the rural residential interface, it is impossible to allow the natural fire regime to control forest densities at this time. At the present time, a naturally occurring fire, such as one caused by lightening, would have a high potential to be an intense stand-replacement fire and to threaten human lives and property.

Most stands within the proposed treatment area can be managed to continue their development of multicanopy, multispecies, and multiage class conditions. Many conifer trees in all size classes and canopy layers still have the capacity to expand in height and crown width. In terms of tree size, old-growth and late-successional-like conditions can be produced on these sites. Older forest types in the Douglas-fir series have a tendency toward simple structure with few canopy layers. This is probably caused by the presence of one or only a few tree-form species capable of forming the forest canopy.

Stand diversity can be increased by leaving fewer large trees per acre, thus allowing faster conifer growth in the understory. Trees in various canopy positions compete with each other, and leaving more trees in the overstory will require managing for fewer trees in the understory if specific stem-size characteristics are going to be met within a defined period. Retention of less overstory permits understory trees to grow to merchantable size at a faster rate and thus intermediate canopy levels are produced more quickly.

Forest stands with the most timber volume are located on the cooler aspects and in the draws. The midstory condition is dense pole to mature size timber which occurs in solitary or interlocked patches. These patches usually are less than fifteen acres in size. Natural regeneration is present where natural gap formation has created openings or in areas with an overstory canopy of less than 60%. Understory trees tend to grow slowly in the northern portion of the watershed unless the overstory basal area is below 100 ft^2 /acre and overstory crown closure is less than 40%.

If the current vegetative conditions continue, many high-density mid-seral stands will remain in the lower ranges of merchantability. Without disturbance, slow diameter growth will prolong the time it takes for the densely growing small diameter trees to attain large or merchantable diameter. These stands are currently so dense that the expeditious development of structure and differentiation necessary to provide quality late-successional habitat and to provide quality merchantable trees for future harvest is being compromised.

1. Late-Successional Reserve

The southern half of the Murphy Watershed includes a small portion of the Deer or IV Late-Successional Reserve (LSR). The LSR will be managed to protect and enhance conditions of mature and old-growth (late-successional) forest ecosystems. The management objective is to maintain functional, interacting, late-successional ecosystems. Natural ecosystem processes such as low-level disturbances are intended to be maintained.

Late-successional forests provide certain attributes that are different from early-successional and managed forests. These include large, live old-growth trees, snags, down logs on the forest floor, logs instreams, complex structure provided by multiple canopy layers, canopy gaps, and species diversity. A primary objective of this LSR is to protect these attributes where they presently exist and to promote them where they currently do not exist.

An important function of LSR's is the connectivity they provide for a network of old-growth forest ecosystems. The Deer or IV LSR provides an important corridor of older forest habitat connecting the northern California wildlands with southern Oregon and eventually Kalmiopsis and Wild Rogue Wildernesses. The east / west older forest link helps connect the coastal mountains east across the valley to the Cascades.

Many acres of forest inside of the established LSR's are young, managed stands created through past management practices. Silvicultural manipulation of these early-successional forests can accelerate the development of some of the structural and compositional features of late-successional forests.

Restoring natural forest conditions by reducing stocking levels within young plantations and mid seral stands, improving species diversity, an accelerating the development of late-successional characteristics can be accomplished while reducing the potential for large-scale disturbances. This is consistent the NFP-ROD's encouragement to "use silvicultural practices to accelerate the development of overstocked young plantations into stands with late-successional and old-growth characteristics, and to reduce the risk to late-successional reserves from severe impacts resulting from large-scale disturbances and unacceptable loss of habitat." Recent studies of forest stand structural development in western and southern Oregon have demonstrated that the structural development of overstocked young plantations are more likely to achieve old-growth attributes if they are thinned prior to eighty years of age, whereas unthinned areas of the same type are *unlikely* to develop on a structural trajectory like the old-growth stands that the LSR's are designed to enhance and preserve.

G. SPECIES AND HABITATS

1. Terrestrial Species and Habitats

a. Special Status and Survey and Manage Plants

In the Murphy Watershed, habitat for Special Status and Survey and Manage plants differs between current and reference conditions. Changes have occurred primarily from fragmentation of habitat due to agricultural use, rural residential development and timber harvest. There have also been changes in species composition due to fire suppression. The reduction of late-successional habitat required by the three Survey and Manage vascular plant species lends uncertainty to the long-term health of these species. As habitat continues to shrink, those populations in existence will become more isolated with little chance of expansion. This will also make them more susceptible to extirpation by chance events (such as a hot-burning wildfire, especially on the south-facing aspects of the watershed) that could cause major perturbations in numbers of individuals per population and numbers of populations in the region (i.e., southwestern Oregon). As the numbers of individuals and populations decrease, and is reduced, the chance of extirpation of these three species from this region increases.

The reason these species were originally determined to be survey and manage was because their future viability was uncertain due to their dependence on late-successional habitat. Late-successional reserves designated by the Northwest Forest Plan do not provide refuge for the majority of populations of these species in this region of Oregon. The majority exist on the lower- elevation Matrix lands. The 1999 Management Recommendations prepared as part of the NFP not only discuss the need to protect known sites of these species, but also recommend retaining canopy closures of 60% or greater and protecting mychorrhizal associations by limiting disturbance to the duff layer. This could also improve the chances for protection of rare nonvascular plant species which also require late-successional, structurally-diverse habitat. An ecosystem management approach could ensure that a natural range of ecosystem variability is retained which would include habitat for the variety of species dependent upon it.

Besides a decrease in late-successional forest habitat, the biggest difference in conditions affecting species diversity is the reduction in number and size of natural openings. These openings are filling in with shrubs and trees due to lack of fire. This reduces the likelihood of survival of healthy populations of such species as *Lotus stipularis var. stipularis* or the *Pellea* species, both of which are far less plentiful than the Survey and Manage species already discussed. Botanically, managing to maintain such habitats is as important as managing for late-successional habitats. Similarly, managing for serpentine habitat is important as it harbors by far the highest concentrations of special status plants in southwestern Oregon.

While working to maintain such habitats, care must be taken to ensure that any nonvascular Survey and Manage species are protected from treatments that could decrease population viability. This is especially true in oak woodlands where *Dendriscocaulon intricatulum* and *Lobaria hallii* have been found.

BLM policy, as stated in the Medford District Resource Management Plan (RMP), includes the objective of "studying, maintaining or restoring community structure, species composition and ecological processes of special status plants." The RMP includes management actions and directions that require the maintenance or enhancement of habitats such as these.

b. Wildlife

(1) Species

The conservation of native biodiversity on federal land is limited by a number of factors including: the availability of species to repopulate habitat, land ownership, the spatial distribution of the federally-controlled land, and habitat quantity and quality.

The extirpation of native wildlife from an area alters how the remainder of the community functions. Native species play roles that benefit the community as a whole. Removal of one species may lead to a population imbalance in another. Historically, wolves and grizzly bears served as predators in the watershed. The act of predation played a critical role in the community. Prey remains not consumed by the wolf were available to a host of other animals. Deer and elk populations were kept in balance and the community as a whole benefitted from the predation. When exotic species are introduced into a community the food chain is altered. For example, historically the watershed did not contain largemouth bass (*Micropterus salmoides*). The introduction of this species has had deleterious effects on turtles, frogs, and ducks.

Species known to be extirpated from the watershed include grizzly bear and wolf. Wolves have remained on the sensitive species list due to sightings of large canids within southwestern Oregon. Currently, Oregon is not included in the recovery plans for either of these two species. Species such as the wolverine that have remnant populations in the province may have the ability to recover in this watershed, but due to the checkerboard land ownership pattern the federal government has limited options to promote the remote habitat these species require.

Habitat quantity and quality are critical factors determining the absence or presence of species in the watershed. Species with narrow habitat requirements, such as late-successional-dependent species, will not maintain populations in areas void of older forest. Table V-1 displays the expected habitat trend for species of concern in the Murphy Watershed.

It can be expected that the BLM's commercial forest land in the watershed will continue to be harvested for timber. The Northwest Forest Plan requires that a minimum of 16-25 large (21"+) leave trees (+21") per acre be left in all harvested units, which will result in the long run (50+ years) in a multiage, multicanopied forest. In the short run it is expected that mature trees will be harvested, resulting in a decline of older forest in the watershed. Specific actions such as commercial thinning may possibly hasten the development of older forest in the watershed, which would be beneficial for the majority of the species of concern. At the existing level of management, it is not expected that these forests will retain snags, down wood, or the high canopy closure necessary to allow for long-term maintenance of late-successional species.

Table V - 1: Expected Federal Habitat Trends for Species of Concern

Common Name	Habitat	Expected Habitat Trend
Grey wolf	Generalist, prefers remote tracts of land	Decrease in the watershed
White-footed vole	Riparian alder / small streams	Increase in habitat as riparian areas recovers from past disturbance
Red tree vole	Mature conifer forest	Decrease in matrix, increase in LSR
California red tree vole	Mature conifer forest	Decrease in matrix, increase in LSR
Fisher	Mature conifer forest	Decrease in matrix, increase in LSR

Table V - 1: Expected Federal Habitat Trends for Species of Concern

Common Name	Habitat	Expected Habitat Trend
California wolverine	Remote / high-elevation forest	Decrease in matrix, increase in LSR
American marten	Mature conifer forest	Decrease in matrix, increase in LSR
Ringtail	Rocky bluffs, caves and mines	Possible decrease in habitat as hard rock mines / quarries reopen
Peregrine falcon	Remote rock bluffs	No known nesting habitat available
Bald eagle	Riparian / mature conifer forest	Decrease in matrix, increase in LSR
Northern spotted owl	Mature conifer forest	Decrease in matrix, increase in LSR
Marbled murrelet	Mature conifer forest	Decrease in matrix, increase in LSR
Northern goshawk	Mature conifer forest	Decrease in matrix, increase in LSR
Mountain quail	Generalist	Stable
Pileated woodpecker	Mature conifer forest / snags	Decrease in matrix, increase in LSR
Lewis' woodpecker	Oak woodlands	Possible increase as oak woodlands are treated
White-headed woodpecker	High-elevation mature conifer forest	Decrease in matrix, increase in LSR
Flammulated owl	Mature ponderosa pine / mature Douglas-fir forest	Decrease in matrix, increase in LSR
Purple martin	Forage in open areas near water / cavity nesters	Increase as riparian areas recover and forest mature in the LSR, possible decrease in matrix.
Great grey owl	Mature forest for nesting / meadows & open ground for foraging	Increase in foraging habitat, decrease in nesting habitat in matrix, decrease in foraging habitat in LSR, increase in nesting habitat.
Western bluebird	Meadows / open areas	Decrease in LSR as clearcuts recover, increase in matrix as oak woodland treatments are accomplished.
Acorn woodpecker	Oak woodlands	increase as oak woodland treatments are accomplished.
Tricolored blackbird	Riparian habitat / cattails	Stable / increase as riparian habitat recovers
Black-backed woodpecker	High-elevation mature conifer forest	Decrease in matrix, increase in LSR
Northern pygmy owl	Conifer forest / snags	Decrease in matrix, increase in LSR
Grasshopper sparrow	Open savannah	Decrease until management strategy developed for savannah habitat
Bank swallow	Riparian	Increase as riparian habitat recovers
Townsend's big-eared bat	Mine adit / caves	Decrease as adits collapse and human disturbance increases
Fringed myotis	Rock crevices / snags	Decrease in matrix, increase in LSR

Table V - 1: Expected Federal Habitat Trends for Species of Concern

Common Name	Habitat	Expected Habitat Trend
Silver-haired bat	Conifer forest	Decrease in matrix, increase in LSR
Yuma myotis	Large trees / snags	Decrease in matrix, increase in LSR
Long-eared myotis	Large trees / snags	Decrease in matrix, increase in LSR
Hairy-winged myotis	Large trees / snags	Decrease in matrix, increase in LSR
Pacific pallid bat	Large trees / snags / rock crevices	Decrease in matrix, increase in LSR
Western pond turtle	Riparian / uplands	Increase as riparian habitat recovers
Del Norte salamander	Mature forest / talus slopes	Increase in the LSR, possible decrease in Matrix.
Foothills yellow-legged frog	Riparian / permanent flowing streams	Increase as riparian habitat recovers
Clouded salamander	Mature forest / snags / down logs	Decrease in matrix, increase in LSR
Southern torrent salamander (Variegated salamander)	Riparian / cold permanent seeps/streams	Increase as riparian habitat recovers
Black salamander	Talus / down logs	Decrease in matrix, increase in LSR
Sharptail snake	Valley bottom	Stable
Calif. Mtn. Kingsnake	Generalist	Stable
Common kingsnake	Generalist	Stable
Northern sagebrush lizard	Open brush stands	Stable
Tailed frog	Riparian / mature forest	Increase as riparian habitat recovers

(2) Dominant Processes from Historic Conditions to Current Conditions

The settlement of the watershed and the subsequent division of land between public and private ownership limits the ability of the Federal agencies to restore historic conditions in the watershed. Currently, the checkerboard ownership pattern of the federally-managed land and the fragmentation and patch size of the remaining late-successional forest habitat will partially determine the ability of the watershed to support many species of concern. This is particularly true for species with low dispersal capabilities such as the Red tree vole and the Del Norte salamander. In addition, limited federal ownership of land within some plant communities precludes the recovery of some species of concern without the action of private land owners. These habitats include native grasslands, oak savannahs, and anadromous fish-bearing streams (riparian habitat). In addition, the suppression of fire within the watershed has changed vegetative patterns and historic habitat distribution. Species dependent on fire-created habitats have been negatively affected through fire suppression.

The majority of the species of concern are associated with late-successional forest habitat. This habitat has been altered, both on private and federally-managed lands, by timber harvest. Species associated with this habitat type have been negatively affected through the conversion of older stands to younger stands. At the same time, species utilizing early seral habitat and edges have benefitted from this shift of older forest to younger forest. Timber harvest and road building have also led to increased sedimentation, increased stream temperatures, and decreased stream stability and structural diversity, which in turn negatively affect aquatic and semi-aquatic wildlife. Road building also decreases the effectiveness of a number of habitats due to disturbance and has further fragmented patches of late-successional forest.

Potential limiting factors for recovery of habitats of sensitive species exist in watershed, including fire suppression, habitat loss, and fragmentation. Historically, many habitats within the watershed were created and maintained by disturbance events, particularly by fire. Fire has, for the most part, been excluded from the watershed for the last 40 years. Fire-created habitats and associated wildlife species have been adversely affected by effective fire suppression. This is particularly true for oak / savannah and pine stands. Currently, timber harvest is the dominant disturbance found in the watershed.

Habitat loss and fragmentation occurs both on the valley floor and in the uplands. Habitats found along the valley floor have experienced fragmentation due to clearing for home sites and agriculture land. Due to this fragmentation and the resultant patch size and altered access for wildlife, many sites no longer meet their full biological potential. Of particular concern are the remaining oak woodlands and Ponderosa pine sites. The loss of these habitat types will continue to contribute to the decline of associated species of wildlife.

Historically, the extent of old-growth forest was never stable and continually fluctuated through time. Forests are constantly developing towards their climax community while simultaneously being set back to earlier seral stages by disturbances. Historically, when large-scale disturbances moved through the watershed the amount of old growth would be low. As time passed, the old-growth habitat would recover, allowing species associated with this habitat to recolonize the watershed. Colonization was aided by the higher population levels of old growth dependent species as well as the greater amount of mature and old-growth forest historically present in the region. This larger amount of old-growth forest allowed for greater connectivity of habitat and easier dispersal of species associated with this habitat. Due to the checkerboard ownership pattern outside the LSR, and past timber harvesting, the remaining mature and old-growth habitats are widely fragmented. Species dependent on older forest such as the American marten (*Martes americana*), the Fisher (*Martes pennanti*), and the northern spotted owl (*Strix occidentalis*), have limited habitat outside the LSR. Some of the remaining older stands no longer serve as habitat for late-successional forest-dependent species due to the amount of edge the stands contain, the amount of edge is increased by irregular shapes and small sizes. The edge-to-interior ratio effects how useful the stand is for some late-successional species. Stands with a great deal of edge no longer have functioning interior forest habitat. The microclimatic changes of the edge effect can be measured up to three tree lengths into the interior of the stand (Chen 1992).

Isolated patches of old-growth habitat may be too small to support the maximum diversity of species. In heavily fragmented environments, larger predators that naturally occur at low densities are lost first (Harris and Gallagher 1989). The California wolverine (*Gulo gulo luteus*) utilizes high-elevation undisturbed habitat and its population is now of concern due to fragmentation. Fragmented habitats lead to isolated populations of animals which lose genetic vigor, and is a serious threat to biological diversity (Wilcox and Murphy 1985). Functioning old-growth corridors are critical for ensuring gene-pool flow, natural reintroduction, and successful pioneering of species into unoccupied habitat. Animals disperse across the landscape for a number of reasons including the location of food, cover, mates, refuge, and unoccupied territory. The vast majority of animals must move during some stage of their life cycle (Harris and Gallagher 1989). Dispersal corridors function when they provide hiding and resting cover. Species that depend on late-successional forest are poor dispersers and more vulnerable to extinction in fragmented landscapes than species associated with early successional stages (Noss 1992). This is particularly true for flightless species such as the Fisher (*Martes pennanti*). Fishers are reluctant to travel through areas lacking overhead cover (Maser, *et al,* 1981) and are at risk for genetic isolation. Species that are more mobile, such as the spotted owl, may be capable of dispersing into isolated patches of habitat, but run a higher risk of predation when crossing areas of unsuitable habitat.

Small patches of old-growth forest can provide important refugia for poor dispersers and species with small home ranges, such as the Del Norte salamander (*Plethodon elongatus*), allowing for recolonization into surrounding areas if future conditions become more suitable. Isolated patches of old growth also offer important refugia for a number of late-successional associated bryophytes, fungi, and plants.

Areas with a high density of roads in the watershed are of concern due to their effects on habitats. The construction of roads also contributes to the delivery of sediment into the aquatic system. Past road building along streams has led to increased channelization of the streams. Sediments can negatively effect fish by filling pools, embedding spawning gravel, and smothering eggs. Roads also lead to increased disturbance such as poaching, and decrease habitat effectiveness. Increased disturbance to deer and elk increase their metabolic rates and decrease their reproductive success (Brown 1985). Roads also further fragment patches of old-growth forest creating edge, which changes interior forest conditions and allows generalist species to compete with old-growth dependent species. Species such as the great horned owl (*Bufo virginianus*) utilize fragmented landscapes and prey on spotted owls.

(a) Expected Habitat Trends

General: The habitat trends for species of concern vary with ownership and plant community. In general, habitats found on private lands have undergone the most significant change from historic conditions. Public lands managed by the federal government have undergone less dramatic change, but are in a notably different condition than in pre-settlement times. Expected trends on private lands a tendency for short-term rotation on forest lands (60-80 years), and heavy use of most native grasslands, riparian zone, and oak woodlands for agriculture and homesites. Native plant communities such as grasslands, pine stands, oak savannahs, and old-growth forest, and their associated animal communities, should be considered at risk on private lands. The expected habitat trend for each plant community can be found in the following narrative.

Riparian: The condition of the riparian habitat is dramatically different from pre-settlement conditions. Timber harvest, road building, water withdrawals and urbanization have led to poorly functioning stream systems. Recovery of the aquatic biodiversity on public land is partially limited by the condition of private land in the watershed. Many of the low-gradient streams found in the watershed are on private land. These areas historically contained the best spawning habitat for fish. The expected trend for riparian habitat is to remain static or decrease in condition due to increasing demand on resources. Quality of riparian habitat on federal land should increase under the forest plans. Cooperative agreements among parties within the watershed would be necessary to insure continued viable populations of fish and wildlife.

Pine Habitat: Maps produced between 1856-1894 by the General Land Office, and the revestment notes of 1916, characterize portions of the valley floor as having been dominated by oak and pine. Many of these stands have been lost on private land through timber harvest and conversion to homesites and agriculture. The majority of pine stands on public land have seen some form of timber management; other stands have been allowed to degrade due to fire suppression and encroachment of fire-intolerant species. The expected trend for private land is for continued harvesting of this habitat on a short-term rotation base. Pine habitat found on commercial forest land will continue to be available for timber harvest.

Oak Woodlands: Oak woodlands within the watershed are disappearing faster then they are regenerating. The precise acreage of this habitat type historically found in the watershed is unknown. The revestment notes of 1916 demonstrate a greater occurrence of oak woodlands than what currently exists today. The expected trend on private lands for oak woodlands is for acreages to remain static or decline. The majority of federal oak woodland is found on land withdrawn from the timber base, and traditionally has largely been unmanaged. The North Murphy Forest Management Project strives to begin a reversal of this trend on federal land and will use a series of prescribed burns to reintroduce fire into the white oak plant associations.

Old-Growth Forest: Little if any private old-growth forest remains in the watershed. Due to short rotations between timber harvests on private land, there is not expected to be an increase in old-growth forest on private land. Quantity and quality of old-growth forest located on federal land are expected to decrease under the forest plan but increase in the late-successional reserve.

(b) Species

The conservation of native biodiversity is limited by a number of factors including the availability of species to repopulate habitat, land ownership, the spatial relationship of the federally-controlled land, and habitat quantity and quality. Extirpation of native wildlife from an area alters how the remainder of the community functions. Native species play roles that benefit the community as a whole. Removal of one species may lead to population imbalances in others. Historically, wolves and grizzly bears served as a predators in the watershed. Predation by these species played a critical role in the community. Prey remains not consumed by the wolf were available to a host of other animals. Deer and elk populations were kept in balance, and the community as a whole benefitted from the predation.

When exotic species are introduced into a community the food chain is set out of balance. Historically, the watershed did not contain Largemouth bass (*Micropterus salmoides*). The introduction of this species has had deleterious effects on turtles, frogs, and ducks.

Species known to be extirpated from the watershed include grizzly bear and wolf. Wolves have remained on the sensitive species list due to sightings of large canids within southwestern Oregon. Currently, Oregon is not included in the recovery plans for these two species. Species such as the wolverine that have remnant populations in the province may have the ability to recover in this watershed, but due to the checkerboard ownership the federal government has limited options to promote the remote habitat these species require.

Habitat quantity and quality are a critical factors determining the absence or presence of species in the watershed. Species with narrow habitat requirements such as late-successional dependent species, will not maintain populations in areas void of older forest. The amount of recovery or loss of a species population varies by species, but in general it is expected that species requiring old-growth / late-successional forest will decrease in numbers on lands classified as Matrix and increase in numbers within the LSR.

2. Aquatic Species and Habitats

a. Stream and Riparian Trends - Private (Nonfederal) and Federal Lands

The future trend in aquatic habitat conditions in the Murphy Watershed will be influenced by three major limiting factors: (1) successional stage of vegetation in riparian zones; (2) the amount of stream flow between early summer and fall, and (3) the rate and magnitude of sediment delivery. The expected fish habitat trend in the watershed will vary by land ownership.

b. Riparian Reserves and Coarse Woody Material

Streamside shade and coarse woody material on federal lands are expected to increase over time. It is estimated that it may take approximately 150-300 years for streamside areas on federal land to attain late-successional forest characteristics without active riparian management. Active riparian management in many instances can accelerate the development of late-successional forest attributes such as large trees. Large mature trees contribute to fish habitat complexity after falling into a stream. Age and structural diversity of vegetation in riparian areas on federal land are thus expected to increase in response to management such as that proposed by the Aquatic Conservation Strategy.

Quality of stream and riparian habitat on private land is expected to decrease as a result of continued timber harvest in unentered or lightly harvested timber stands. The amount of coarse woody material in the riparian area on private land is expected to continue to diminish due to natural processes and timber harvest. It will not be replaced to any appreciable degree because the large conifers in riparian transition zones will be logged when they reach commercial size.

c. Instream - Large Woody Debris

The greatest potential for improvement in fish habitat complexity through large woody debris in a flow channel will be on federal lands. All streams on federal land will become more effective in dissipating stream flow energy; scouring pools; providing complex habitat for fish, amphibians and invertebrates; and providing organic detritus.

Boulders and rubble, rather than large wood, play major roles in creating fish habitat in larger streams (i.e. >3rd order). However large woody debris continues to be important in the steeper streams by dissipating stream energy (i.e., forming a stepped channel profile), controlling the movement of sediment and small organic matter and providing habitat for fish and amphibians.

Riparian condition, as well as contribution of large woody debris to streams, will improve on federal land as the BLM implements projects under Aquatic Conservation Strategy (ACS) objectives.

Class 3 and 4 streams on forested private land may become less capable of controlling movement of sediment and fine organic material and providing habitat for amphibians because of the lack of amount of large woody debris.

d. Sedimentation

Stream sedimentation is expected to decrease instream reaches on federal lands with the continued implementation of the ACS. This assumes that new activities will not contribute to existing sedimentation problems. However, there may not be an appreciable decrease in the overall amount of sediment deposited instreams if road construction standards and logging practices do not substantially improve on nonfederal lands. Many roads and tractor skid roads on private lands do not receive regular maintenance, nor were most of them designed with adequate drainage or erosion control features. Sediment from these areas can be expected to create negative cumulative effects downstream.

e. Stream Flow

Summer stream flows on federal lands are expected to increase in the future, as a result of the Northwest Forest Plan Standards and Guidelines. Intensity and frequency of peak flows will diminish as vegetation regrows in previously harvested areas and as road mileage is reduced to meet ACS objectives. Potential indirect adverse effects of altered peak flows on salmonid reproduction would diminish. This assumes that timber harvest on private land will continue at no greater than the present rate and that new road construction on private land will not offset efforts to reduce road mileage on public lands.

Irrigation and mining diversions have decreased the amount of water available to fish during low-flow periods. Changes in the landscape are caused from agriculture (water diversions), roads, and timber harvest. Irrigation withdrawals exacerbate the adverse effects of poor land management and continue to cause declines in native fish populations.

f. Stream Temperature

Summer stream temperatures in areas with predominately federal land holdings should decrease with continued implementation of the ACS. Summer stream temperatures where private land ownership dominates will continue to increase if canopy closure continues to be altered on class three and four streams. Until adequate canopy closure is attained within the Riparian Reserves, summer temperatures will continue to exceed ODEQ standards within the tributaries and the mainstem Applegate River.

g. Aquatic Species

Factors outside the Murphy Watershed will continue to influence anadromous fish returns to the watershed. These include ocean productivity, recreational and commercial fish harvest, predation in the Applegate and Rogue Rivers', estuary and ocean contributes habitat changes due to human developments in floodplains, and migration and rearing conditions in the Rogue and Applegate Rivers'. The habitat environments of Pacific lamprey correspond with those of steelhead and consequently, trends for both species will be similar. Reticulate sculpin populations in the Rogue River Basin are expected to remain stable.

Coho salmon are federally listed as a threatened species. Implementation of the Aquatic Conservation Strategy on public land will improve watershed health. Potential for recovery of anadromous fish habitat is moderately poor because the majority of the watershed is in nonfederal ownership. However, there is potential for private land owners to affect stream health downstream. More sediment- and temperature- intolerant aquatic insect taxa will be present in the Applegate River tributaries as watershed conditions improve. Collector-dominated communities in these small streams would gradually shift to scrapers and shredders as canopy closure and the conifer component increases. Composition of aquatic macroinvertebrate communities in the Applegate River will probably remain much as it is.

Current resource management practices and water diversions on private lands, which are beyond the scope of the Aquatic Conservation Strategy, will continue to limit potential for recovery of salmon and steelhead habitat and populations. The philosophy of the Aquatic Conservation Strategy must be applied equally across all ownerships to achieve the potential for recovery of at-risk fish stocks.

Private forest lands will no doubt continue to be managed intensively for wood production. The cumulative effects of management activities have substantially altered the timing and quantity of erosion and have changed in-stream channels, both of which have affected fish production. Streams and riparian areas with federal ownership are in better condition than streams on private lands. The trend will likely continue.

H. FIRE MANAGEMENT

A major difference between the existing and the reference condition is the change in the fire regime. The watershed has gone from a low-severity to a high-severity fire regime. Previously, fire occurred frequently and burned with low intensity, and functioned largely in maintaining the existing vegetation. Currently, fire is infrequent, burns with high intensity, causes high degrees of mortality, and replaces vegetation rather then maintains it. This has resulted from nearly a century of fire suppression and exclusion. The change in vegetative conditions, fuel profile, and amount of fuel present is now such that a large wildfire will have severe effects on vegetation, erosion, habitat, and water quality. Stand replacement as a result of wildfire was a low percentage in the reference condition. Existing conditions would produce 50% to 75% stand replacement today. The current trend is for increasing fuel hazard buildup and increasing risk for fire ignition due to population growth and human use within the watershed and adjacent region.

The magnitude of this change is widespread throughout the entire watershed. Only nine percent of the watershed is currently in a low hazard condition. High hazard conditions occur throughout the watershed and in 45% of its area. Vegetation in the watershed is at a high degree of risk for mortality and stand replacement from wildfire. The existing and future trend in fuel and vegetative conditions is the predominant factor that will adversely effect the ability to achieve most management objectives for the watershed. The capability of achieving and meeting management objectives in the watershed is low in the long term (20 years plus).

This is of major significance in the LSR portion of the watershed. The portion of the East Illinois / Williams-Deer LSR located in the Murphy Watershed has predominately northerly aspects. These aspects have a greater potential to reach and maintain late-successional habitat than the large area of southerly aspects to the south in the Williams Watershed. The habitat on southerly aspects may not be sustainable over time due to the high risk of stand-replacement fire. There is a need to develop late-successional habitat on sites with north aspects where chances for longevity are improved. (*Applegate Adaptive Management Area Guide, 1998*).

Risk of ignition has increased within the watershed. This is a result of the higher population residing within and adjacent to the watershed. Development has been substantial in the past decade and it appears that it will continue at the same rate.

I. HUMAN USE

Significant changes that have occurred in the watershed include more roads throughout the area, some of which were constructed because of BLM timber sales to access and manage BLM lands. Many other roads were constructed on private land to access and develop properties. More people are living in the area because of the increase in population in southern Oregon as well as people's desire to move out of the city into a rural area. With this increase in population and access comes an increased use of public lands. The type of recreational use is also changing from nonmotorized to motorized (before roads, there were mainly trails which accessed the area). In the past 10 years, there has been less federal timber cutting and more private timber cutting. The demand for timber has been on the private lands due to federal injunctions, changing management objectives on federal lands, and the high monetary value of timber. Due to the increase in population and access, as well as an increase in landfill fees, there has been an increase in illegal activities such as dumping, living on BLM land, and firewood cutting and collection.

VI. MANAGEMENT RECOMMENDATIONS

A. PURPOSE

The purpose of recommendations is to bring the results of the previous steps to conclusion by focusing on management recommendations that are responsive to watershed processes identified in the analysis. Recommendations also document logic flow through the analysis, linking issues and key questions from step 2 with the step 5 interpretation of ecosystem understandings. Recommendations also identify monitoring and research activities that are responsive to the issues and key questions and identify data gaps and limitations of the analysis (Federal Guide for Watershed Analysis, Version 2.2, 1995.)

B. RECOMMENDATIONS

Tables VI-1 through VI-5 list recommended management actions that will lead towards the desired future condition of the Murphy Watershed in each of the land allocations. Actions that are required by the RMP, NFP, or other decisional document may not be included in these recommendations tables.

It is important to keep in mind that these recommendations are **not** management decisions. The recommendations may conflict or contradict one another. They are intended as a point of departure for project specific planning and evaluation work. Project planning then includes the preparation of environmental assessments and formal decision records as required by the National Environmental Policy Act (NEPA). It is within this planning context that resource conflicts would be addressed and resolved and the broad recommendations evaluated at the site specific or project planning level. Project planning and land management actions would also be designed to meet the objectives and directives of our Medford District Resource Management Plan (RMP).

C. DATA GAPS

Significant data gaps are identified in Table VI-6.

Table VI - 1: Recommendations - All Land Allocations

Land Allocation	Issue / Concern	Related Core Topic	Location	Recommendation
All	Ponds	Human Uses (Fire), Species and Habitat (Wildlife)	Watershed Wide	Where possible, maintain and improve ponds to enhance their value to wildlife and fire suppression use.
All	Deer Winter Range	Species and Habitat (Wildlife)	Areas Located Below 2,000 Feet	Seasonal closure of roads in areas identified as important deer winter range. Minimize new permanent road construction and restrict management activities between November 15 to April 1.

Table VI - 1: Recommendations - All Land Allocations

Land Allocation	Issue / Concern	Related Core Topic	Location	Recommendation
All	Watershed with Mixed Ownership	All	Non-BLM lands	Work with non-BLM land owners through forums such as watershed councils, partnerships, etc. on projects, planning and activities to promote a watershed wide perspective and consideration. Projects could include working with Special Status / Survey and Manage plants and their habitats, restoring riparian and fish habitat, modifying irrigation diversions and fish barriers that jeopardize juvenile fish passage, roads, wildlife, fire, recreation projects and current vegetation treatments.
All	Meadows, Oregon White Oak Groves, Shrub lands, Ponderosa Pine Sites, Serpentine Habitat	Species and Habitat (Botany, Wildlife), Vegetation	Watershed Wide	Restore Ponderosa pine, Oregon white oak, meadows and shrub land habitat. Appropriate methods would include such things as thinning, brushing and burning. Restore Jeffery pine sites. Institute low-intensity prescribed fire to reduce herbaceous layer accumulation and shrub / tree encroachment. Preclude ground disturbance activities such as OHV use.
All	Noxious Weeds	Species and Habitat (Botany), Vegetation	Watershed Wide	Develop an active control program for noxious weeds in the watershed.
All	Road Closures	Fire	Watershed Wide	Utilize gate closures and signing during periods of very high to extreme fire danger.
All	High-Intensity Fire Occurrence	Fire, Erosion Processes, Wildlife	Watershed Wide	Prioritize and implement fuel hazard reduction treatments at strategic locations throughout the watershed. These areas would be located on areas such as ridgetops or other natural or human made features which can function as barrier to wildfire spread; along property boundaries, within or around areas of high values at risk of loss from wildfire. They would create opportunities to compartmentalize wildfires into small drainages and prevent large-scale wildfire occurrence. Additionally, they reduce the risk of a high-intensity fire occurrence and return to a condition that would exhibit a low-intensity fire regime
All	Helispots	Fire	Watershed Wide	Create helispots and pump chances as opportunities and needs are identified. The highest priority for this would be in the northern part of the watershed.
All	Fire Hazard	Fire, Human Uses	Watershed Wide	Pursue fuel hazard reduction work on BLM lands adjacent to private land with highest priority for those adjacent to residential areas. Encourage a coordinated approach with private owners.

Table VI - 1: Recommendations - All Land Allocations

Land Allocation	Issue / Concern	Related Core Topic	Location	Recommendation
All	Dispersed Recreation	Human Uses	Watershed wide	Encourage cooperative agreements and MOUs between BLM, other government agencies and private land owners to promote recreation opportunities.
All	Illegal Uses	Human Uses	Spencer Creek	Work to minimize illegal uses (dumping, firewood cutting) by enforcing rules and regulations, increasing visible presence in the area and educational efforts about protection of resources. Evaluate Spencer Creek area where dumping, firewood cutting has occurred, for possible road closures.
All	Botanical restoration	Botany	Watershed Wide	Institute management strategies to maintain / improve these species' habitats using such techniques as prescribed fire where impacts to Survey and Manage species would not occur.
All				Pursue extensive density management (thinning) in both natural and planted stands. General objectives for this thinning should include reduction of total number of stems, species selection to provide a species mix that more closely resembles that which was thought to occur prior to fire exclusion and logging, and fuels management (prescribed fire) to reduce the activity fuels (slash) created by the density management.
All	Mature Stands / Connectivity	Vegetation / Wildlife Connectivity	Northern portion of Watershed	Design harvest and understory treatments to set the stage for continued and potential development of connectivity corridors. Center these corridors in and adjacent to the Riparian Reserves. While these areas may not be sustainable over time due to the high risk of fire, these stands should be maintained or preserved as long as they provide effective connectivity. A long range plan could be developed with all adjacent land owners using active manipulation, to maintain a full range of stand structures, landscape patterns, processes and species across the landscape.

Table VI - 2: Recommendations - Non-Reserve Allocations				
Land Allocation	**Issue / Concern**	**Related Core Topic**	**Location**	**Recommendation**
All	Botanical	Species and Habitat (Wildlife, Botany)	Mapped Locations	Conduct forest management activities in a manner that mimics natural disturbance, maintains species and structural diversity. Create a mosaic of openings in mature stands through thinning or prescribed fire to provide a more natural habitat special status species such as *Lotus stipularis var.stipularis.*
All	Young Stand Management	Vegetation	Watershed Wide	Emphasize young stand management activities in the seedling / sapling and pole vegetation condition classes (approx.26% of watershed). Apply young stand treatments (e.g., brushing, precommercial thinning, hand piling and burning the resulting slash) to natural stands as well as past old clearcuts. Prioritize management treatments based on site quality as well as past management. Treat the best sites first when consistent with other management objectives. "Link" treatments temporally: projects should not be seen as single events but rather a sequence over time culminating in desired future condition. For example: stand initiation (new age class) to initial canopy closure of the desired number of trees by species per acre. This would incorporate multiple treatments over a 10 to 20 year project window and enhance planning / budgeting efforts.
All	High-Density Forest Stands	Vegetation / Fire	Watershed Wide	Maintain stand densities that promote proper physiological function and keep mortality rates within a range of natural conditions. Utilize thinning, group selection and prescribed fire methods to reduce density of overstocked stands.

Table VI - 2: Recommendations - Non-Reserve Allocations

Land Allocation	Issue / Concern	Related Core Topic	Location	Recommendation
All	High-Density Stands with Low Merchantability	Vegetation / SFP	Watershed Wide	* Investigate contracting methods and low-impact harvesting techniques employing the local communities. The current process for managing vegetative resources predominantly involves contracting; either commercial contracts or appropriations for service type contracts if deemed non-commercial. A hybrid form of contracting, involving both commercial and service contracts over a longer time frame may be a method to achieve the goal of effectively implementing landscape and ecosystem management. An increased number of acres of the landscape may then be placed into their natural range of variability in an efficient and timely manner. * Provide avenues (areas, product sales, contracting options) that encourage the use of the available SFPs. * Mesh the SFP program with the fire hazard reduction activities * Couple the SFP program with the other vegetation treatments to either accomplish them or to utilize the materials cut (where possible and consistent with the requisite treatment time lines). * Where treatments are low capital intensive treatments, provide and use a variety of BLM contracting strategies. *Contract Development* - All units designated for density management / SFP, should be considered available for inclusion in newly-developed contracts. Contract performance time could be designed with longer time frames in order to offer economic opportunities to as many individuals in the AMA as possible, while still meeting forest health objectives.

Table VI - 3: Recommendations - LSR

Land Allocation	Issue/Concern	Related Core Topic	Location	Recommendation
LSR	Late-Successional Forests	Species and habitats	Young Stands	These stands have the potential to become late-successional forest habitat given the right disturbances. The necessary components are present in these stand, and the ability to respond in size, height and to produce late-successional forest habitat. Left untreated many of these stands will remain in a non-late-successional seral stage condition and will lose the ability to respond do a release that would occur naturally through a disturbance such as wind, fire, diseases, slide, snow, etc. Use the existing natural late-successional forest habitat in the watershed as a template of desired structural condition, species mix, etc. Priority stands for treatment are those on the perimeter of quality late-successional forest habitat that currently do not provide this habitat. The goal is to put these stands on a successional trajectory to become LSR habitat and reduce the fire hazard to protect the quality LSR stands. The over riding goal is to increase the extent of interior habitat, while not adversely affecting the current habitat. Both natural stands and plantations should be treated. Singe story stands less than 80 years old that have the potential to provide LS habitat should be treated.
LSR	Habitat, Hazard Reduction	Species and Habitat, Fire	LSR wide	Implement both strategic and site-specific hazard reduction treatments with the objective of creating fuel conditions that will allow the development and long-term maintenance of late-successional habitat. Analyze and provide for presuppression and preattack facilities such as helispots, access and safety zones.
LSR	Habitat	Species and Habitat	LSR wide	In areas where more then 40% of the home range of spotted owls is suitable habitat, thin stands less than 80 years of age, to accelerate the development of older forest components.
LSR	Deer Habitat	Species and Habitat	LSR wide	Enhance deer habitat by increasing forage opportunity by creating small openings, conducting prescribed burns and seeding closed roads with native grasses when available.

Table VI - 3: Recommendations - LSR

Land Allocation	Issue/Concern	Related Core Topic	Location	Recommendation
LSR	Serpentine Habitat	Species and Habitat (Botany), Vegetation	Serpentine Sites in Case Creek drainage	Restore the Jeffrey pine sites. Jeffery Pine savannahs communities on serpentine sites are not capable of producing late-successional forest habitat characterized by high canopy closure, canopy layers, moist understories, etc.. Use low-intensity prescribed fire to reduce herbaceous layer accumulation and shrubs / trees encroachment. Ensure ground disturbing activities such as ORV use are kept to a minimum.
LSR	Canopy Closure	Hydrology	Murphy Creek Subwatershed	Manage the transient snow zone for high canopy closure. Minimize openings so that at least 70% total canopy cover is retained where possible. This does not apply to early seral stages.

Table VI - 4: Recommendations - Special Areas

Land Allocation	Issue / Concern	Related Core Topic	Location	Recommendation
Special Areas	High Value Areas at risk	Fire	Watershed Wide	Reduce fuel hazard within or adjacent to high value area at risk stands. Objective would be to preserve these stands in the short term from loss to wildfire.

Table VI - 5: Recommendations - Riparian Reserves

Land Allocation	Issue / Concern	Related Core Topic	Location	Recommendation
Riparian Reserves		Species and Habitat		Until further analysis, retain the Riparian Reserve widths at the interim Riparian Reserve widths outlined in the NFP and RMP. However, where appropriate based on site conditions and local site analysis, actively manage vegetation and conditions inside the Riparian Reserves to promote or accelerate the attainment of the ACS with particular attention to the long term.

Table VI - 5: Recommendations - Riparian Reserves

Land Allocation	Issue / Concern	Related Core Topic	Location	Recommendation
Riparian Reserves	Large Instream Woody Debris, Coarse Woody Debris (riparian area)	Species and Habitat (Aquatic), Erosion Processes, Water Quality, Water Quantity	Murphy Creek, Iron Creek, Oscar Creek,	Where appropriate based on local site conditions, improve instream complexity by adding key pieces of wood (60+ cm diameter, 1+ bankfull width in length). Appropriate number of pieces of wood per mile reflecting the riparian plant community. Long-term goal is to re-establish coarse woody material consistent with characteristics of the plant series in the riparian zone.
Riparian Reserves	Fish passage / Culverts	Species and Habitat (Aquatic), Human Uses	Board Shanty, Caris, Oscar, Miners, and Rocky Creeks	Improve or remove culverts at stream crossings located on BLM and private land that jeopardize juvenile and adult fish passage. Culverts on fish-bearing streams should have natural streambed.
Riparian Reserves	Fish Barriers	Species and Habitat	Applegate River, Murphy, Caris, and Miller Creeks	Where possible, coordinate the removal of fish barriers to improve fish passage on private lands.
Riparian Reserves	Excessive Water Temperatures	Species and Habitat (Aquatic)	Murphy, Spencer, Grays, Board Shanty, Miller Creeks	Wherever early seral stages occur along creeks, treat vegetation to expedite growth of larger trees for improving stream shading conditions which would improve stream temperature, ensure adequate water temperatures for summer rearing for fish and other aquatic organisms.
Riparian Reserves	Sediment control	Human Uses, Erosion Processes	Headwaters of Spencer, Murphy, and Grays Creeks	Conduct sediment evaluation and reduce drainage ditch flow into natural tributaries. Re-engineer roads.
Riparian Reserves	Sedimentation	Aquatic Species and Habitat, Erosion Processes, Water Quality	Oscar Creek	Wherever possible strive towards restoring spawning or riffle substrate embeddedness to 30% or less and sand content to 15% or less by reduction of fine sediment load and addition of structure. This would ensure adequate spawning gravels for adults. Erosion and sedimentation would be in balance with stream transport capacity resulting in pools with good depth and cover. **(Ok 3/17/99)**
Riparian Reserves	Stand vigor	Habitats	Watershed Wide	Use prescribed fire to reduce fuels loads, recycle nutrients, produce structural components.

Table VI - 6: Data Gaps

Core Topic	Data Gaps
Soils	-- Soil erosion sources have not been mapped or specified as to location and mechanism. There is no information specific to this watershed regarding soil dependent biological communities. -- Field surveys for mass movement features in areas mapped with high susceptibility have not been completed. Also field survey for areas with streambank erosion features. Inventory and monitor for compaction and disturbance features, check for indicators of changes in productivity
Vegetation	-- For portions of the watershed the existing stand inventory data (including snag and down wood data) for the federal lands is outdated and does not accurately represent current stand conditions. Validation of computer growth models in the watershed has not been done for young stands (less than 50 years) to see how they compare to computer models predicting growth. – Additional site-specific analysis of current vegetative conditions will be necessary to prescribe forest management activities. Plant series data needs to be combined with vegetative condition class to determine management opportunities. For example, information on the amount of acres in the Douglas-fir series is available as is information on the amount of pole stands, but not Douglas-fir pole stands. A second example could be acres of Ponderosa pine and white oak being encroached upon by Douglas-fir that require restoration treatments.
Fire	-- Baseline emission data for various plant association and theoretical emission information for various plant association is absent as is smoke dispersion modeling. -- A comprehensive list of nearby residents that have special health concerns with prescribed burning emissions does not exist for use in prescribed fire pre-notification.
Hydrologic / Riparian / Stream inventory	-- Stream surveys and inventory of various hydrologic parameters have not been completed on all BLM lands. (*e.g.*, proper functioning condition, coarse wood, stream class, riparian vegetation, reaches subject to instability). This is baseline information useful in making management recommendations to enhance and improve stream and bank stability. Inventory and classification of Class 3 and 4 streams would be highest priority. Local site-specific, vegetation type specific standards for down wood densities do not exists. -- Comprehensive information regarding headwater conditions for streams relative to sediment production, water contribution and riparian potential does not exist. -- Comprehensive plant and animal species surveys to identify those that inhabit the Riparian Reserves have not been completed.
Botany	-- A comprehensive watershed wide survey of special status and Survey and Manage plants (both vascular and nonvascular) has not been completed. -- *Nonvascular plants:* Few surveys have been conducted; need to survey for at least Survey & Manage species (Strategy 2 and Protection Buffers). A major data gap is the lack of information regarding nonvascular plants in the watershed. Surveys have just begun in the Murphy Watershed for both Survey and Manage and Protection Buffer species as required by the Northwest Forest Plan (1994). So far two Strategy 1 lichen species have been found on oak trees, *Dendriscocaulon intricatulum* and *Lobaria hallii*. The first species listed has only been found on black oak trees, while the second species has also been found on white oaks. Maintaining healthy oak woodlands may be a key to protecting the habitat for these species. -- *Vascular plants*: Only approximately 31% of the watershed has been surveyed, need to survey the remainder. -- *Noxious weeds*: Few surveys have been conducted. Need to control yellow star thistle in the watershed. The Iron Creek ACEC has never been inventoried for Special Status or Survey and Manage species yet includes high quality late-successional forest habitat. More survey information is also needed for the rest of the intact late-successional habitat in the LSR.

Table VI - 6: Data Gaps

Core Topic	Data Gaps
Wildlife	-- Presence / absence information for most of the special status species is unknown. There exists little information on special status species habitats and condition of these habitats in the watershed. Location of unique habitats such as wallows, mineral licks, migration corridor, are for the most part, unknown. -- The location of all mining shafts / adits is needed to assess the extent and value of them as habitat.
Fisheries	-- Comprehensive stream and riparian surveys has not been completed (see hydrologic / riparian data gap above. Physical habitat surveys have not been completed in most streams. Comprehensive surveys to monitor relative abundance, and distribution of fish species, classify all streams, conduct benthic macroinvertebrate surveys would fill many data gaps. Repeating such surveys at 5-10 year intervals would provide better baseline information and trend identification.
Human Use	-- *Transportation Management Objectives (TMOs):* TMOs have not been completed for this watershed. They will be completed as required under the BLM Western Oregon Transportation Management Plan of 1996. This will set the stage for identifying desirable road improvements, decommissioning, and other road management actions in the watershed. BLM noncapitalized roads and skid trails have not been inventoried. -- *Recreation:* There has been no comprehensive inventory of the amount or type of recreational use of the area. There also has been no Recreation Opportunity Spectrum inventory of the existing opportunities that are available in the watershed. This information is important in managing for recreational values. Dispersed recreation trails and mining ditches have not been inventoried and mapped. -- A comprehensive Inventory mining shafts / adits has not been done to determine access and safety issues.

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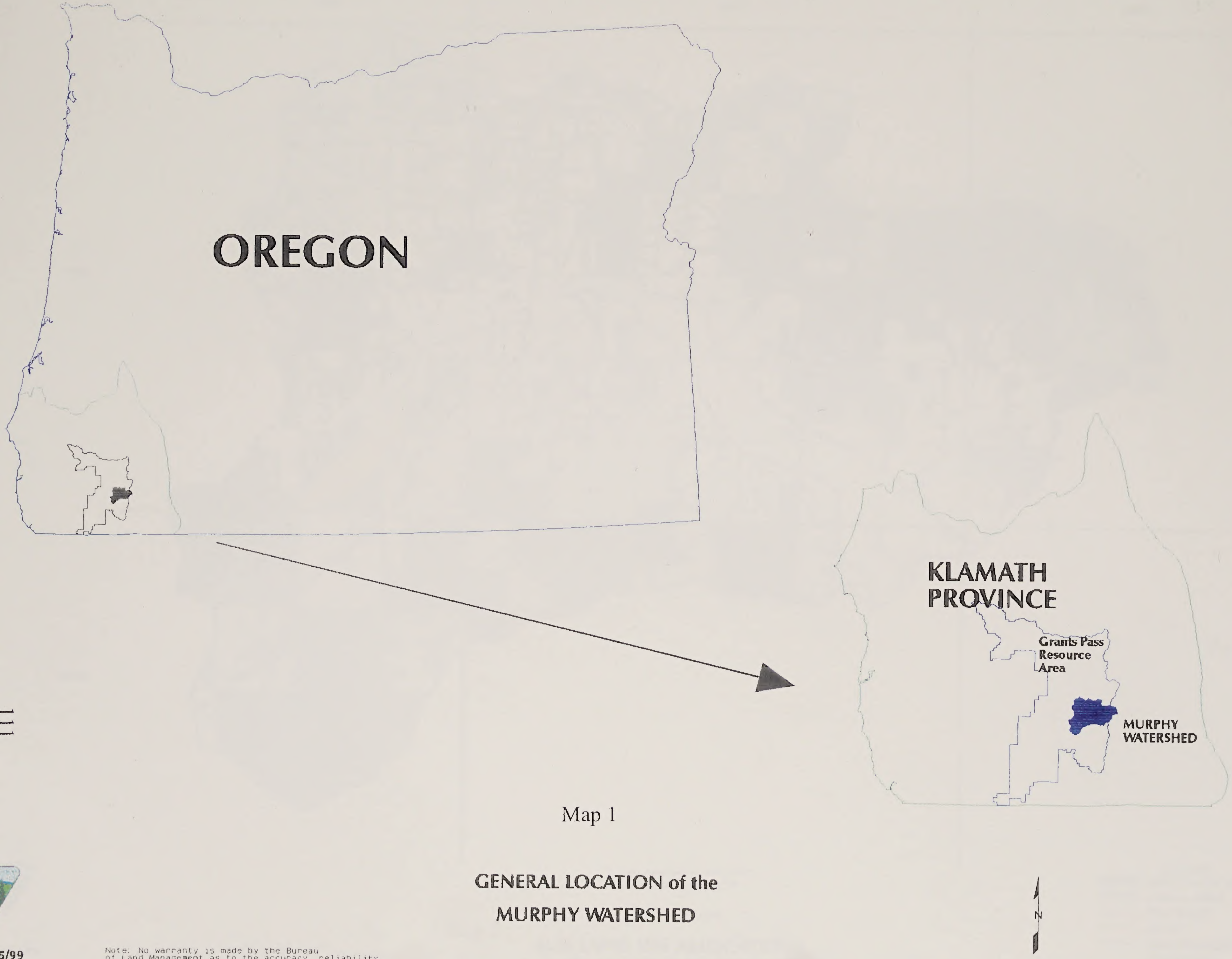
Appendix A: Maps

Map 1: General Location of the Murphy Watershed
Map 2: BLM Land Use Allocations in the Murphy Watershed
Map 3: Dominant Vegetation in the Murphy Watershed
Map 4: Seral Stages on BLM Lands in the Murphy Watershed
Map 5: Plant Series in the Murphy Watershed
Map 6: Vegetation Condition Class in the Murphy Watershed
Map 7: Spotted Owl Habitat Rating (McKelvey) in the Murphy Watershed
Map 8: Stream Orders (>2) in the Murphy Watershed
Map 9: Approximate Distribution of Coho and Chinook Salmonids in the Murphy Watershed
Map 10: Approximate Distribution of Steelhead and Cutthroat in the Murphy Watershed
Map 11: Mineral Potential in the Murphy Watershed
Map 12: Fire Hazard Rating in the Murphy Watershed
Map 13: Fire Risk Rating in the Murphy Watershed
Map 14: Fuel Models in the Murphy Watershed
Map 15: Fire Value Rating in the Murphy Watershed
Map 16: Areas of High Hazard, Risk and Value-at-Risk Ratings in the Murphy Watershed
Map 17: TEP in the Murphy Watershed


OREGON
KLAMATH PROVINCE
Grants Pass Resource Area
MURPHY WATERSHED
N

Map 1

GENERAL LOCATION of the
MURPHY WATERSHED

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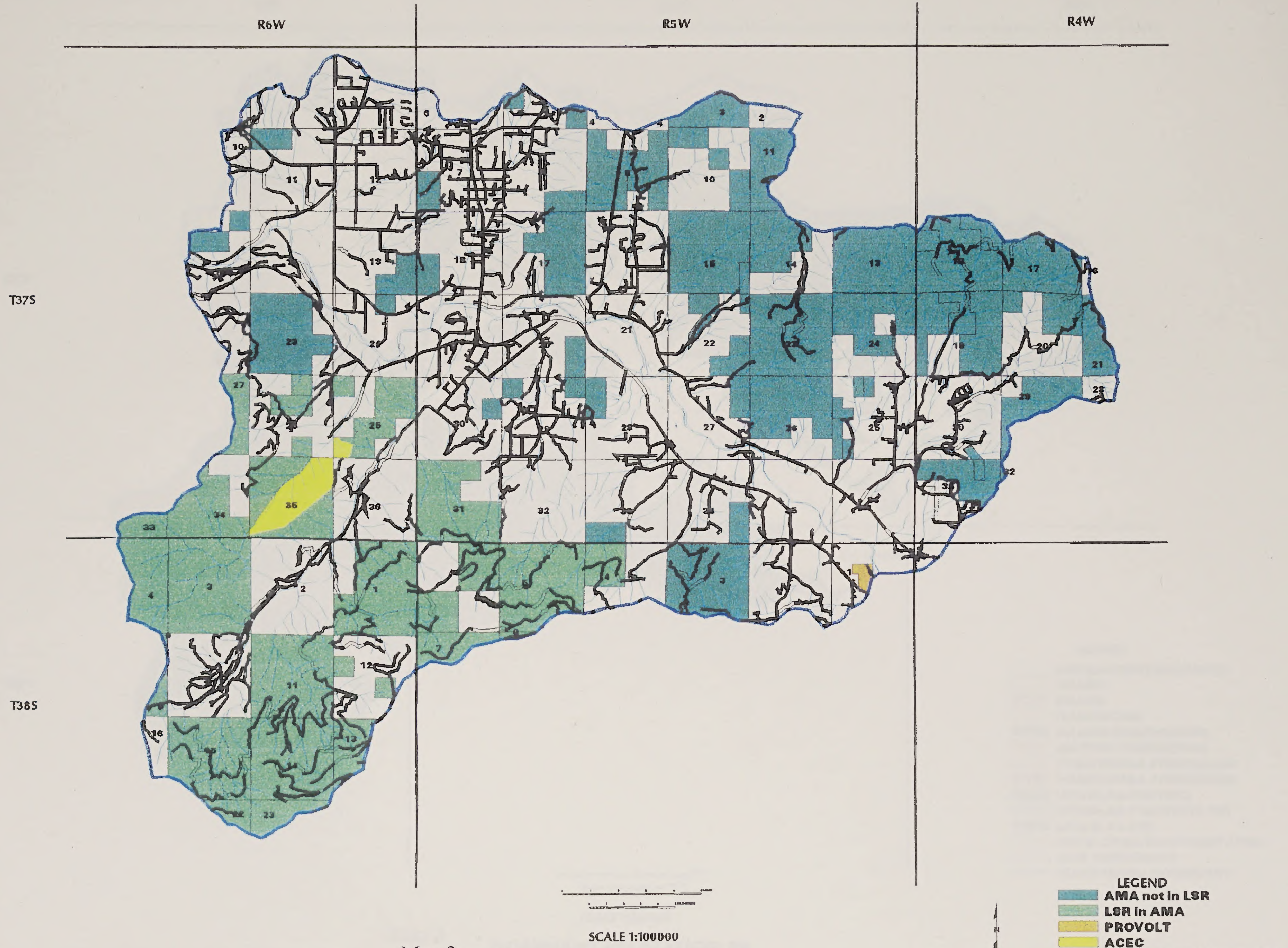
R6W
R5W
R4W
T37S
T38S
SCALE 1:100000
LEGEND
🟦 AMA not in LSR
🟩 LSR in AMA
🟧 PROVOLT
🟨 ACEC
WATERSHED BOUNDARY
STREAMS
ROADS

Map 2

BLM LAND USE ALLOCATIONS
in the MURPHY WATERSHED

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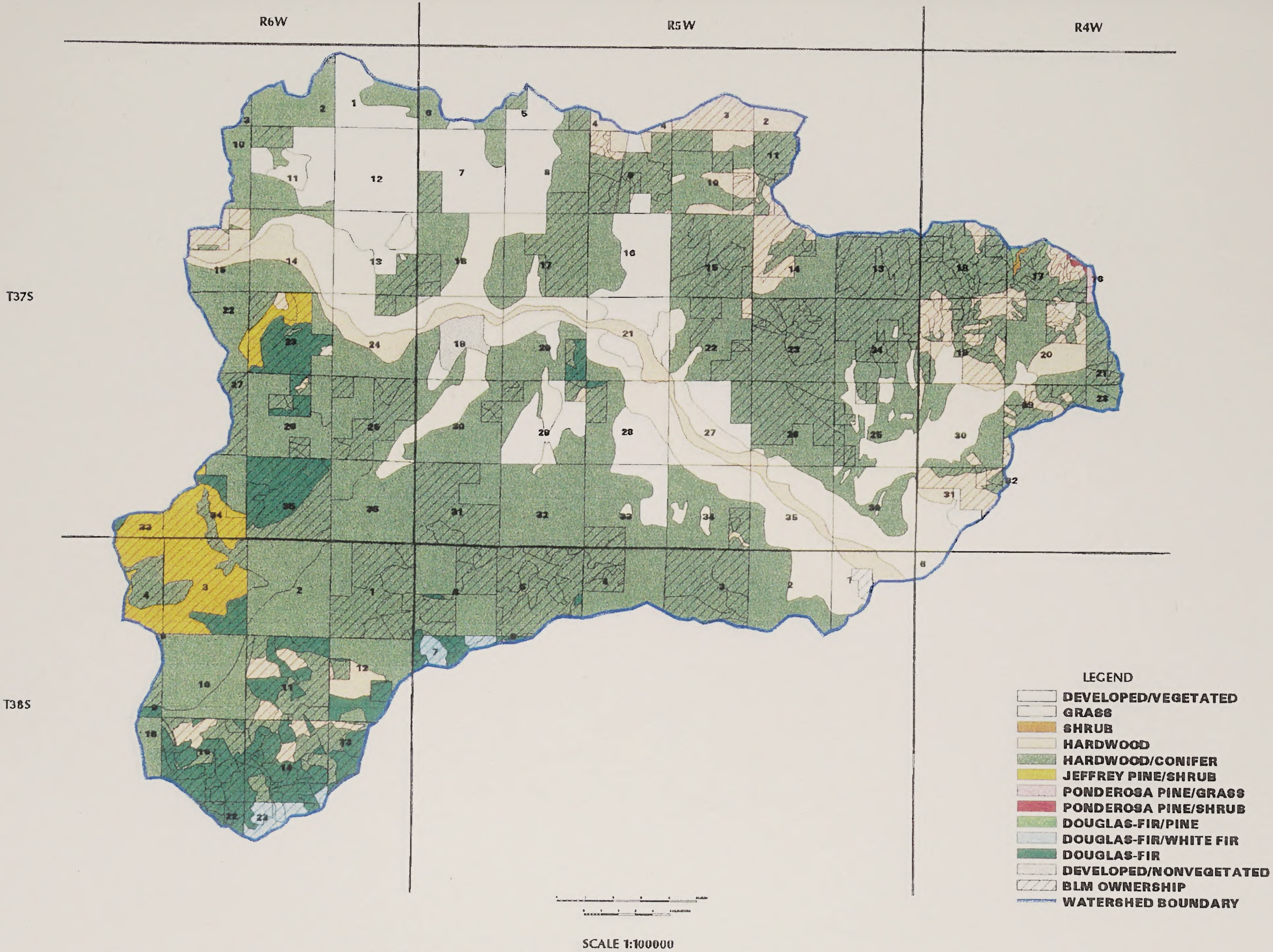
R6W
R5W
R4W
T37S
T38S
LEGEND
DEVELOPED/VEGETATED
GRASS
SHRUB
HARDWOOD
HARDWOOD/CONIFER
JEFFREY PINE/SHRUB
PONDEROSA PINE/GRASS
PONDEROSA PINE/SHRUB
DOUGLAS-FIR/PINE
DOUGLAS-FIR/WHITE FIR
DOUGLAS-FIR
DEVELOPED/NONVEGETATED
BLM OWNERSHIP
WATERSHED BOUNDARY
SCALE 1:100000

Map 3

DOMINANT VEGETATION IN THE MURPHY WATERSHED

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Dennis Glover

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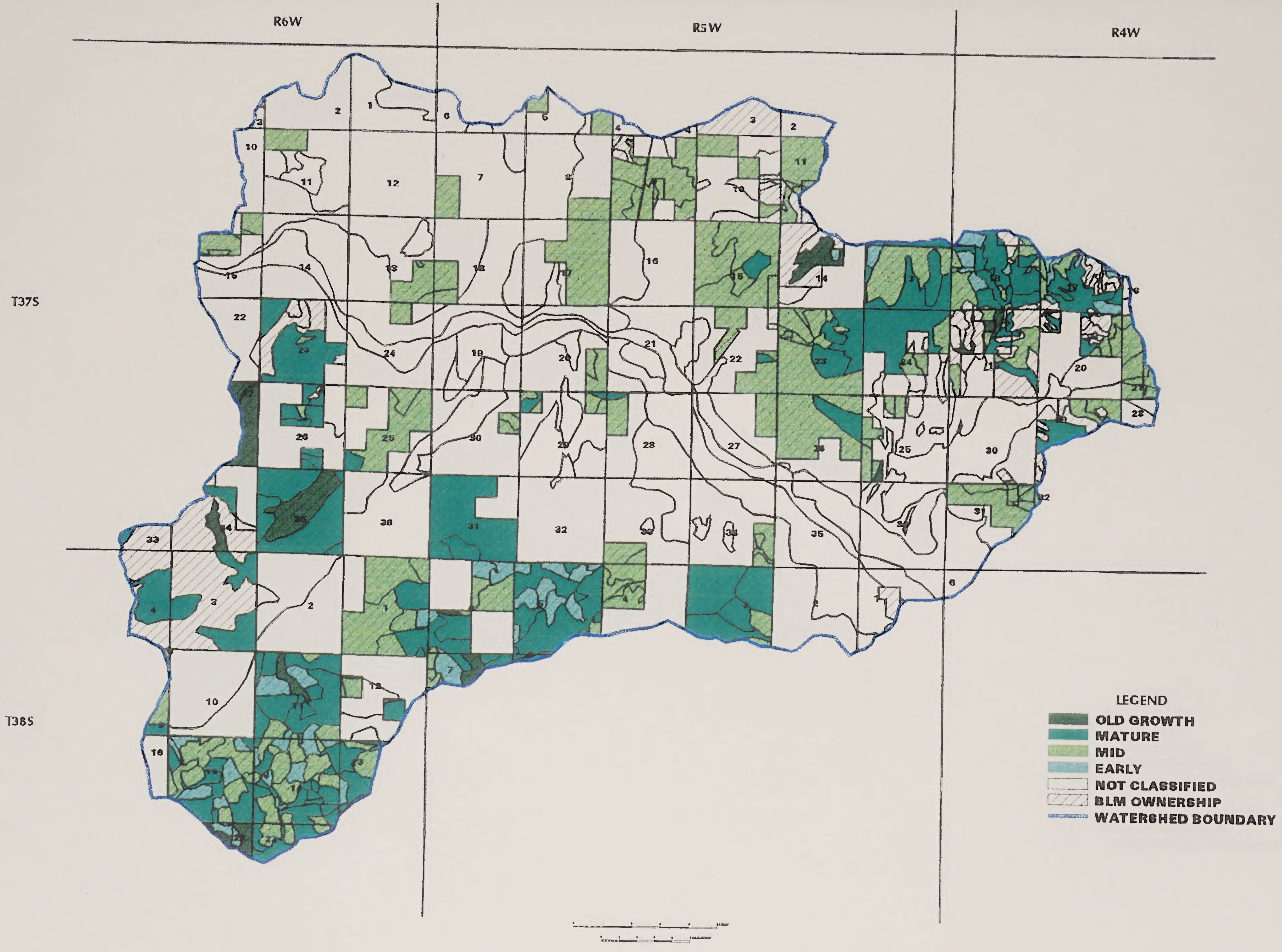
R6W
R5W
R4W
T37S
T38S
LEGEND
OLD GROWTH
MATURE
MID
EARLY
NOT CLASSIFIED
BLM OWNERSHIP
WATERSHED BOUNDARY
N

SCALE 1:100000

Map 4

SERAL STAGES IN THE MURPHY WATERSHED

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Dennis Glover

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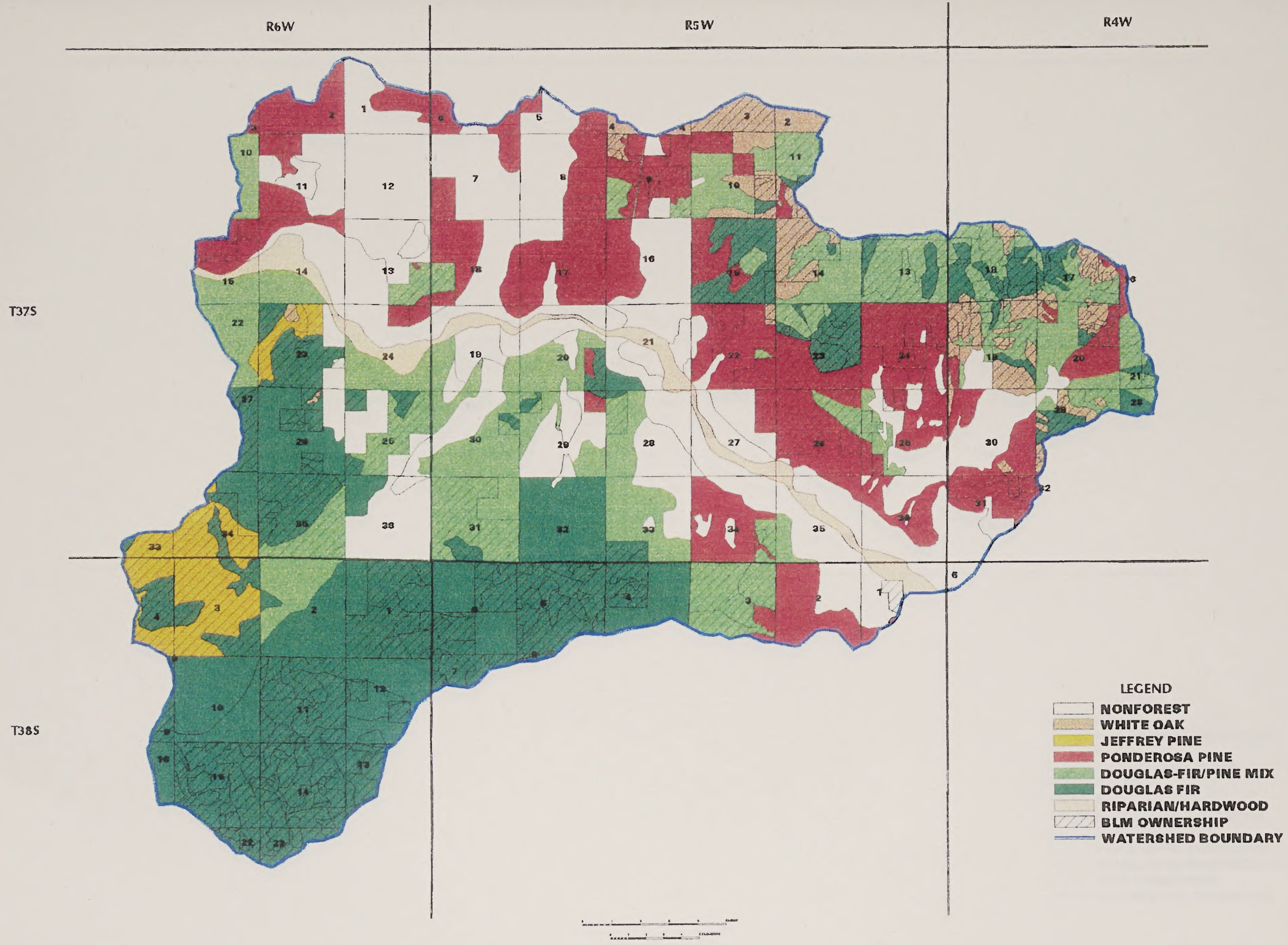
R6W
R5W
R4W
T37S
T38S
LEGEND
NONFOREST
WHITE OAK
JEFFREY PINE
PONDEROSA PINE
DOUGLAS-FIR/PINE MIX
DOUGLAS FIR
RIPARIAN/HARDWOOD
BLM OWNERSHIP
WATERSHED BOUNDARY

SCALE 1:100000

Map 5

PLANT SERIES IN THE MURPHY WATERSHED

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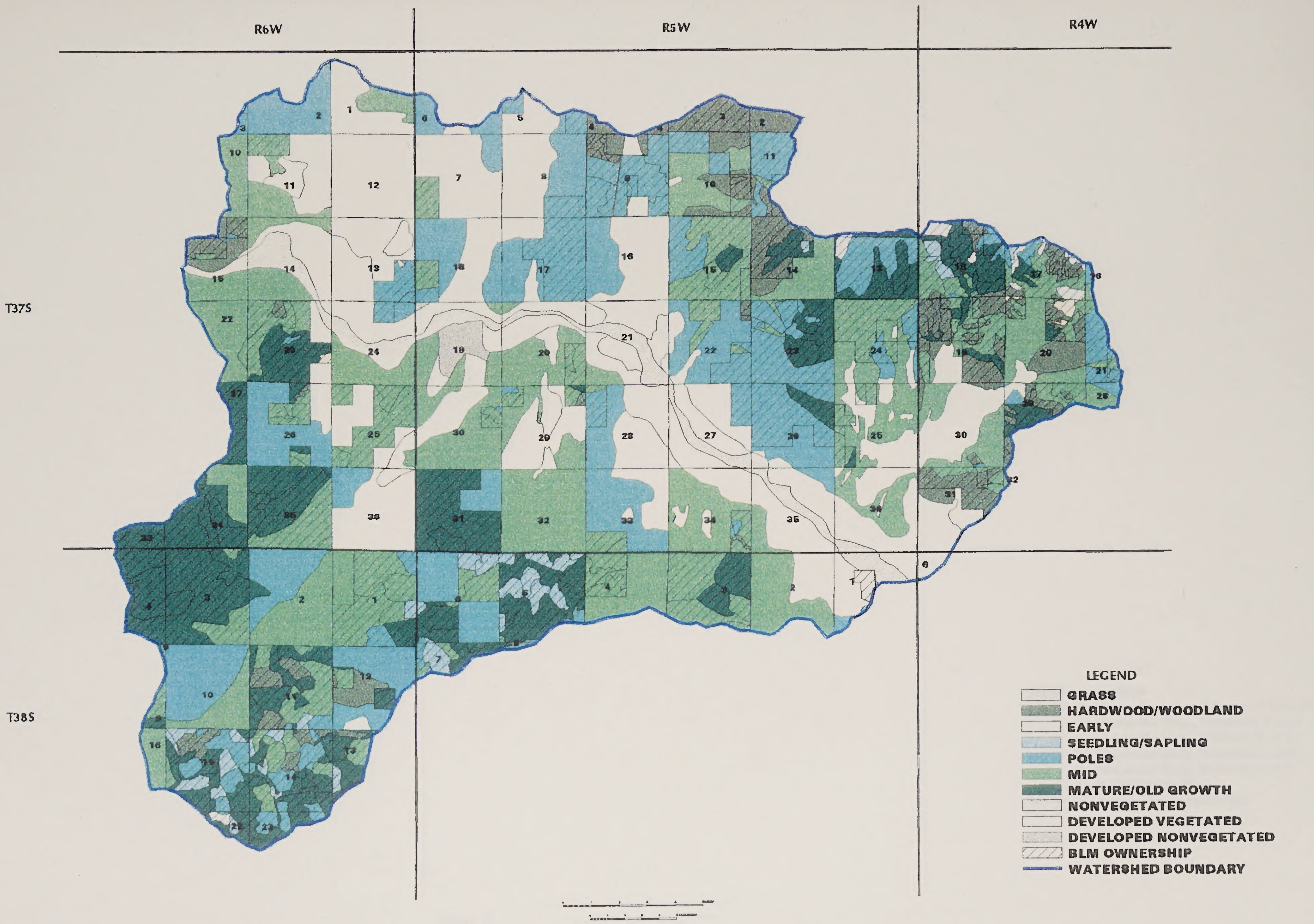
R6W
R5W
R4W
T37S
T38S
LEGEND
GRASS
HARDWOOD/WOODLAND
EARLY
SEEDLING/SAPLING
POLES
MID
MATURE/OLD GROWTH
NONVEGETATED
DEVELOPED VEGETATED
DEVELOPED NONVEGETATED
▨ BLM OWNERSHIP
WATERSHED BOUNDARY
SCALE 1:100000

Map 6

VEGETATIVE CONDITION CLASSES IN THE MURPHY WATERSHED

Note. No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data

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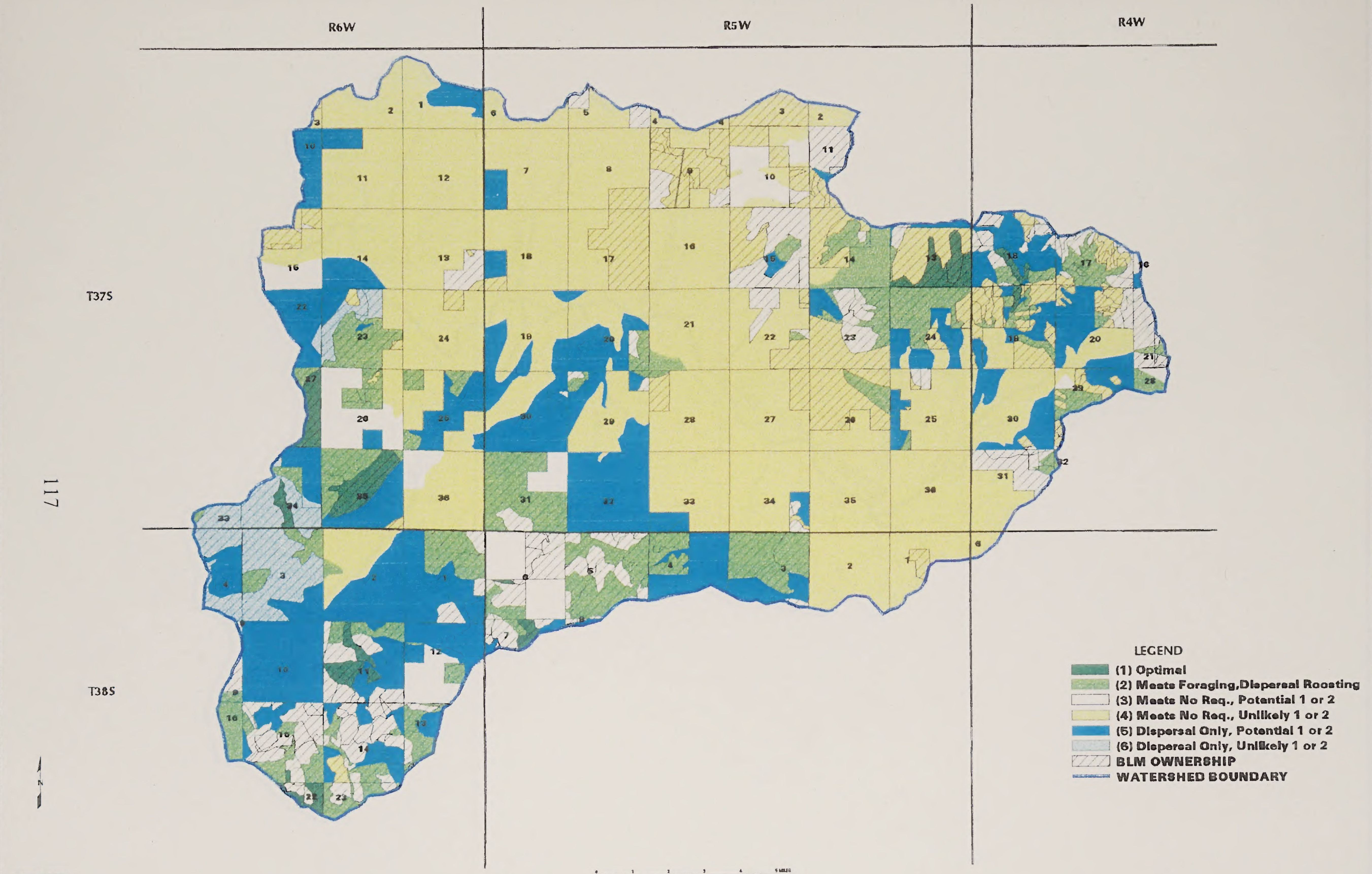
R6W
R5W
R4W
T37S
T38S
LEGEND
(1) Optimal
(2) Meets Foraging,Dispersal Roosting
(3) Meets No Req., Potential 1 or 2
(4) Meets No Req., Unlikely 1 or 2
(5) Dispersal Only, Potential 1 or 2
(6) Dispersal Only, Unlikely 1 or 2
BLM OWNERSHIP
WATERSHED BOUNDARY
SCALE 1:100000

Map 7

SPOTTED OWL HABITAT RATING (McKELVEY) in the MURPHY WATERSHED

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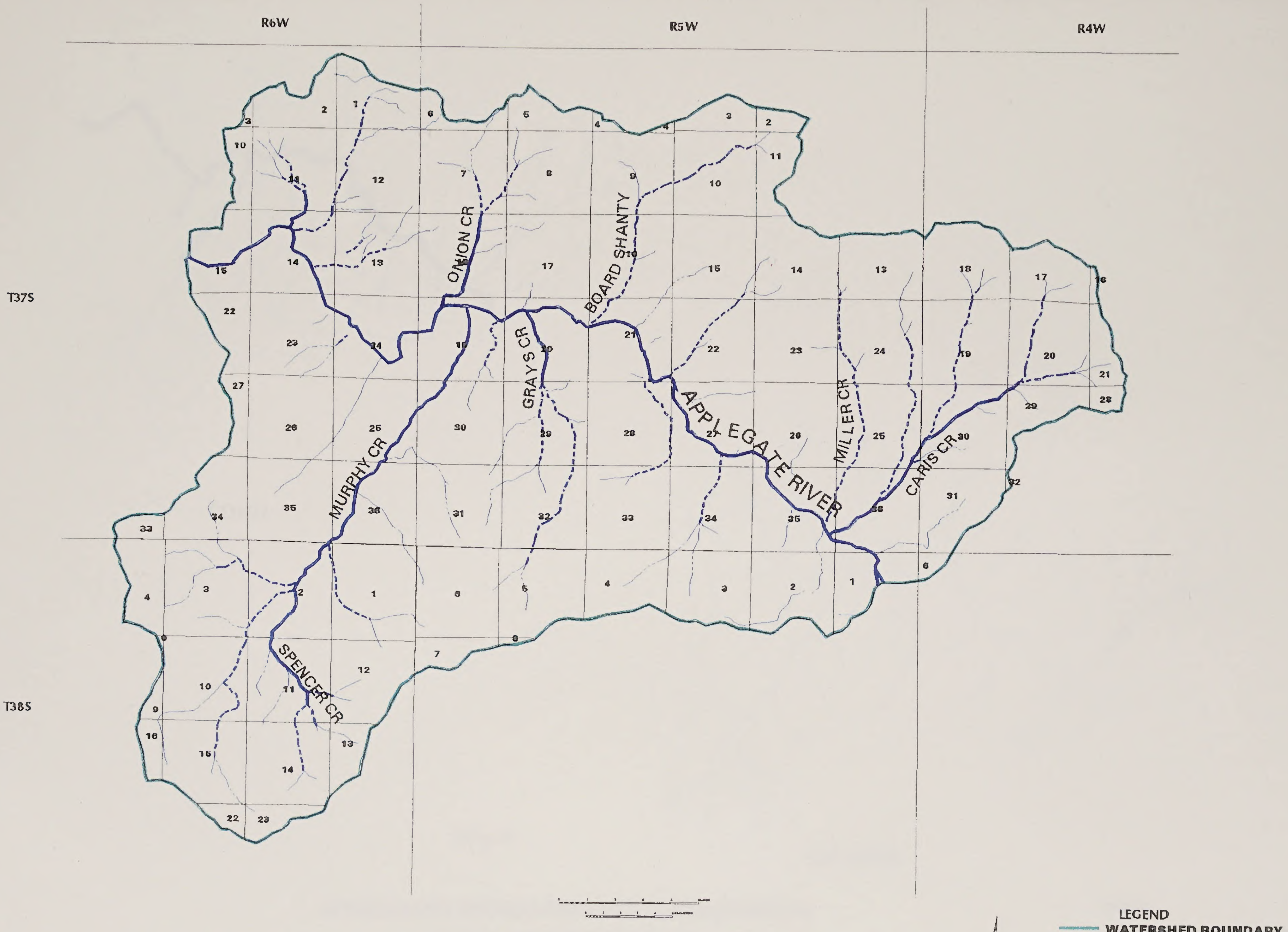
R6W
R5W
R4W
T37S
T38S
ONION CR
BOARD SHANTY
GRAYS CR
APPLEGATE RIVER
MILLER CR
CARIS CR
MURPHY CR
SPENCER CR
SCALE 1:100000
LEGEND
WATERSHED BOUNDARY
3RD ORDER STREAMS
4TH ORDER STREAMS
5TH + ORDER STREAMS

Map 8

STREAM ORDERS (> 2) IN THE MURPHY WATERSHED

02/02/99
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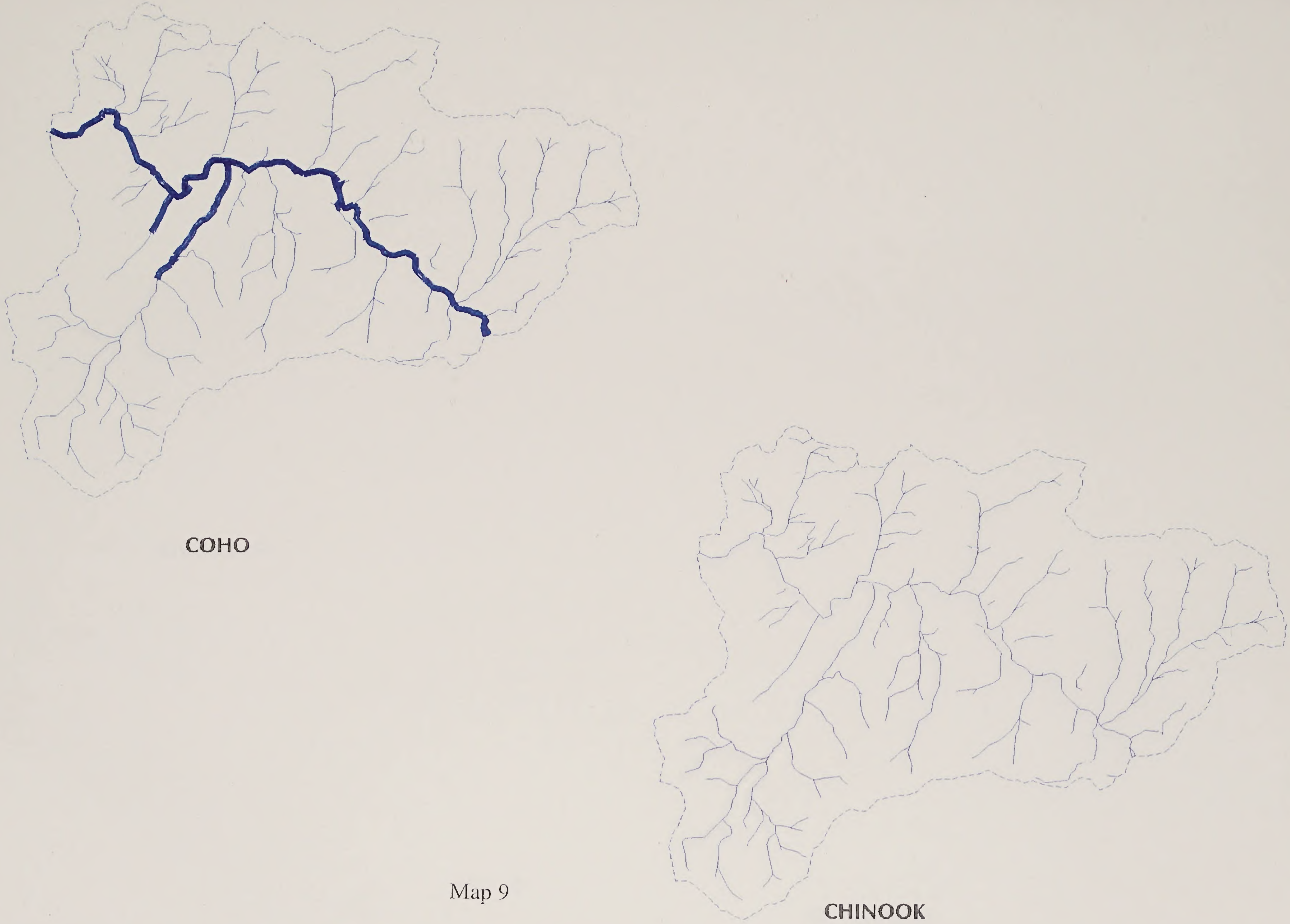

Map 9

APPROXIMATE DISTRIBUTION OF COHO & CHINOOK
IN THE MURPHY WATERSHED

LEGEND

- - - - WATERSHED BOUNDARY
═══ DISTRIBUTION OF FISH

Note. No warranty is made by the Bureau
of Land Management as to the accuracy, reliability,
or completeness of these data for individual use
or aggregate use with other data

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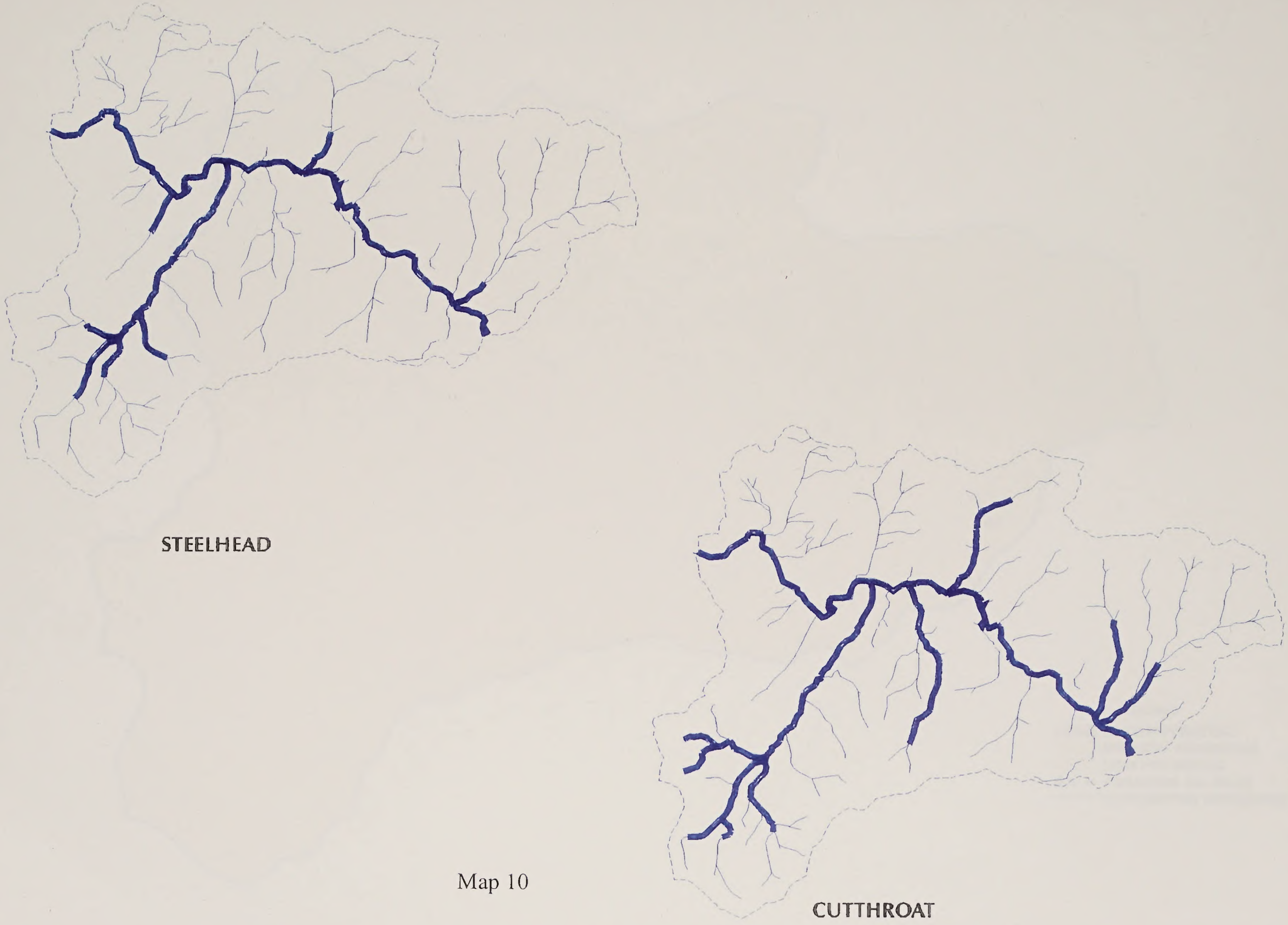

Map 10

APPROXIMATE DISTRIBUTION OF STEELHEAD & CUTTHROAT IN THE MURPHY WATERSHED

LEGEND

- - - - WATERSHED BOUNDARY
═══ DISTRIBUTION OF FISH

01/25/99
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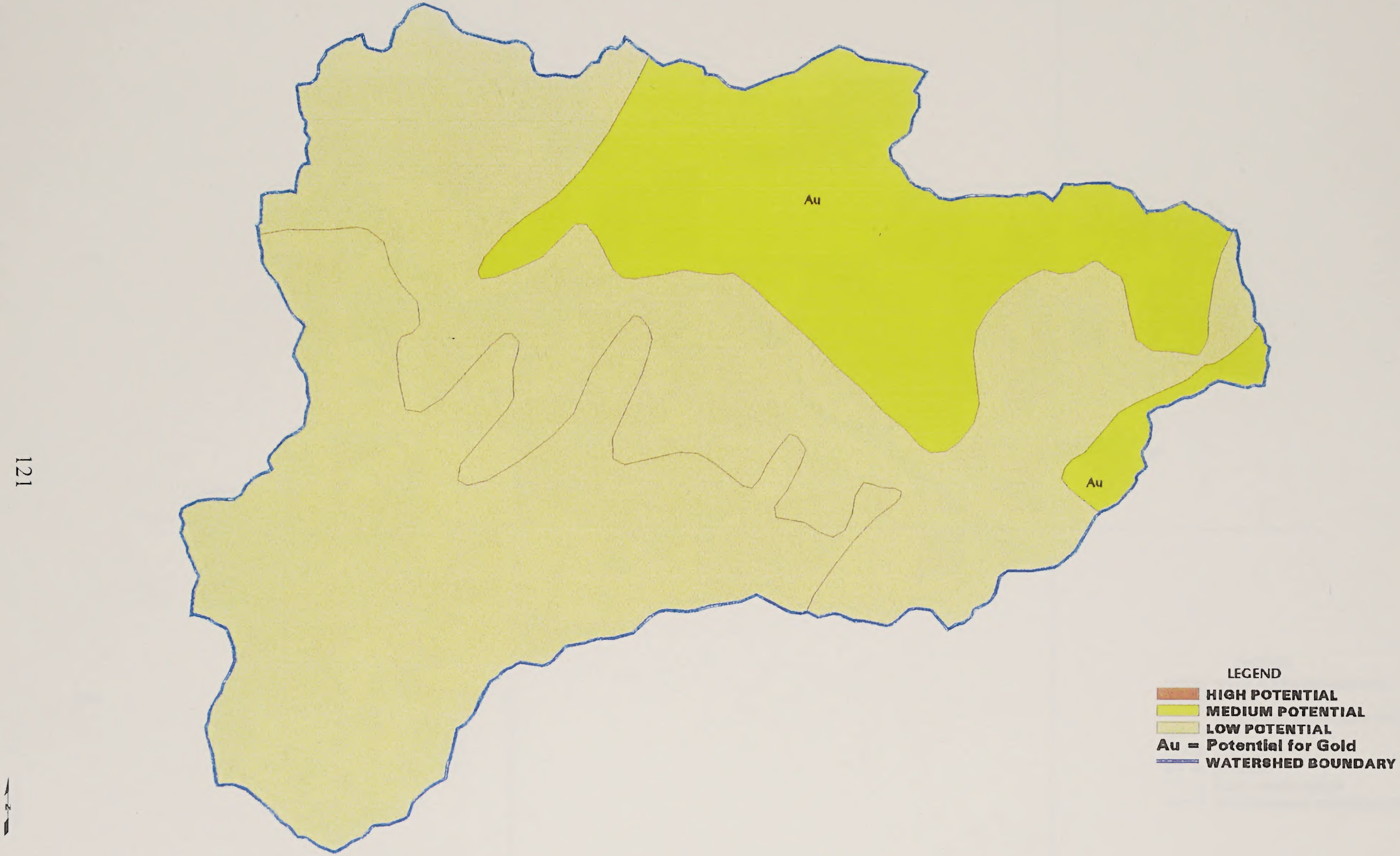
Au
Au
LEGEND
🟧 HIGH POTENTIAL
🟩 MEDIUM POTENTIAL
▨ LOW POTENTIAL
Au = Potential for Gold
WATERSHED BOUNDARY
N

Map 11

SCALE 1:100000

MINERAL POTENTIAL IN THE MURPHY WATERSHED

02/08/99
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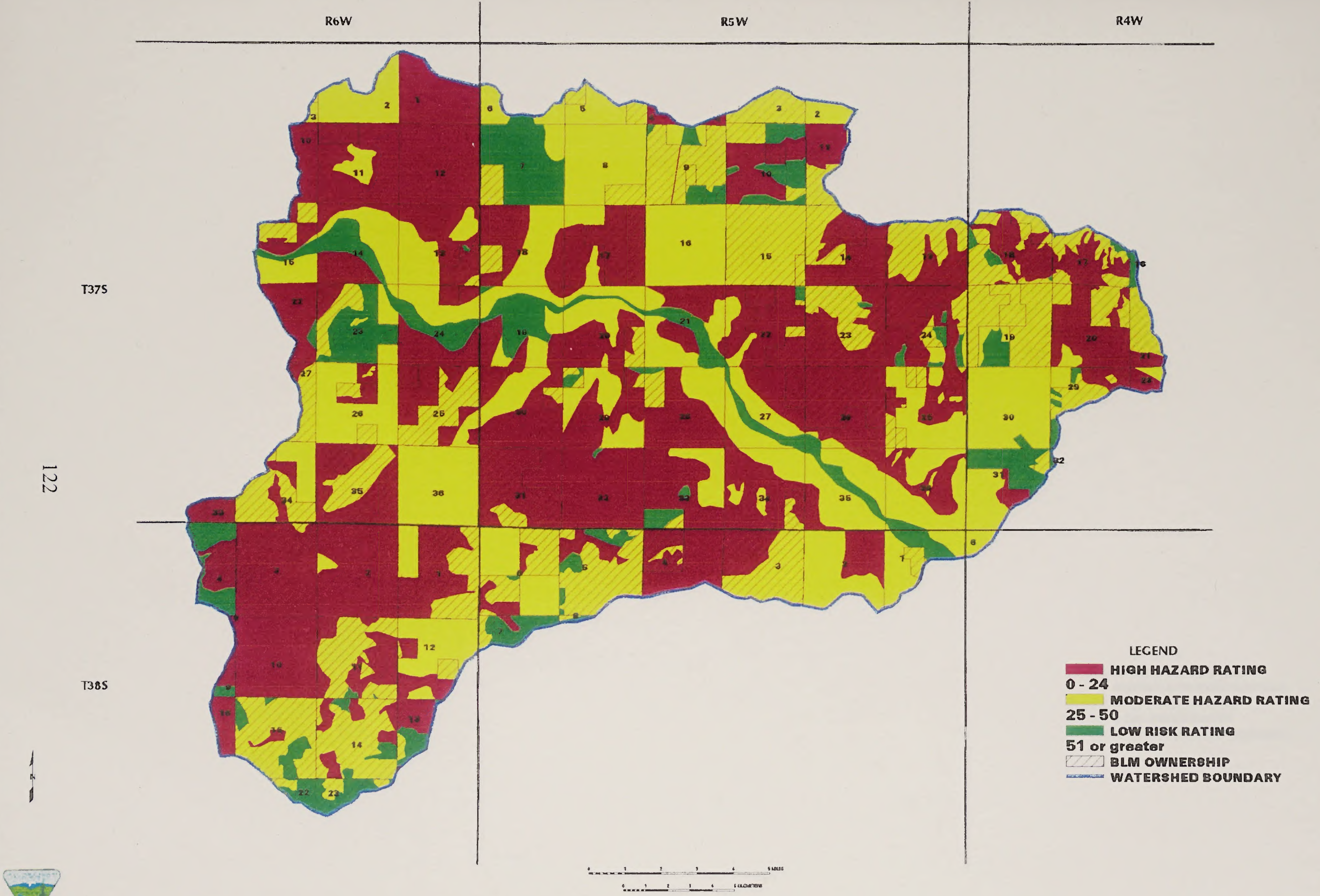
Note. No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.


R6W
R5W
R4W
T37S
T38S
LEGEND
🟥 HIGH HAZARD RATING
0 - 24
🟨 MODERATE HAZARD RATING
25 - 50
🟩 LOW RISK RATING
51 or greater
▨ BLM OWNERSHIP
WATERSHED BOUNDARY
5 MILES
KILOMETERS

Map 12

SCALE 1:100000

FIRE HAZARD RATING in the
MURPHY WATERSHED

Note: No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

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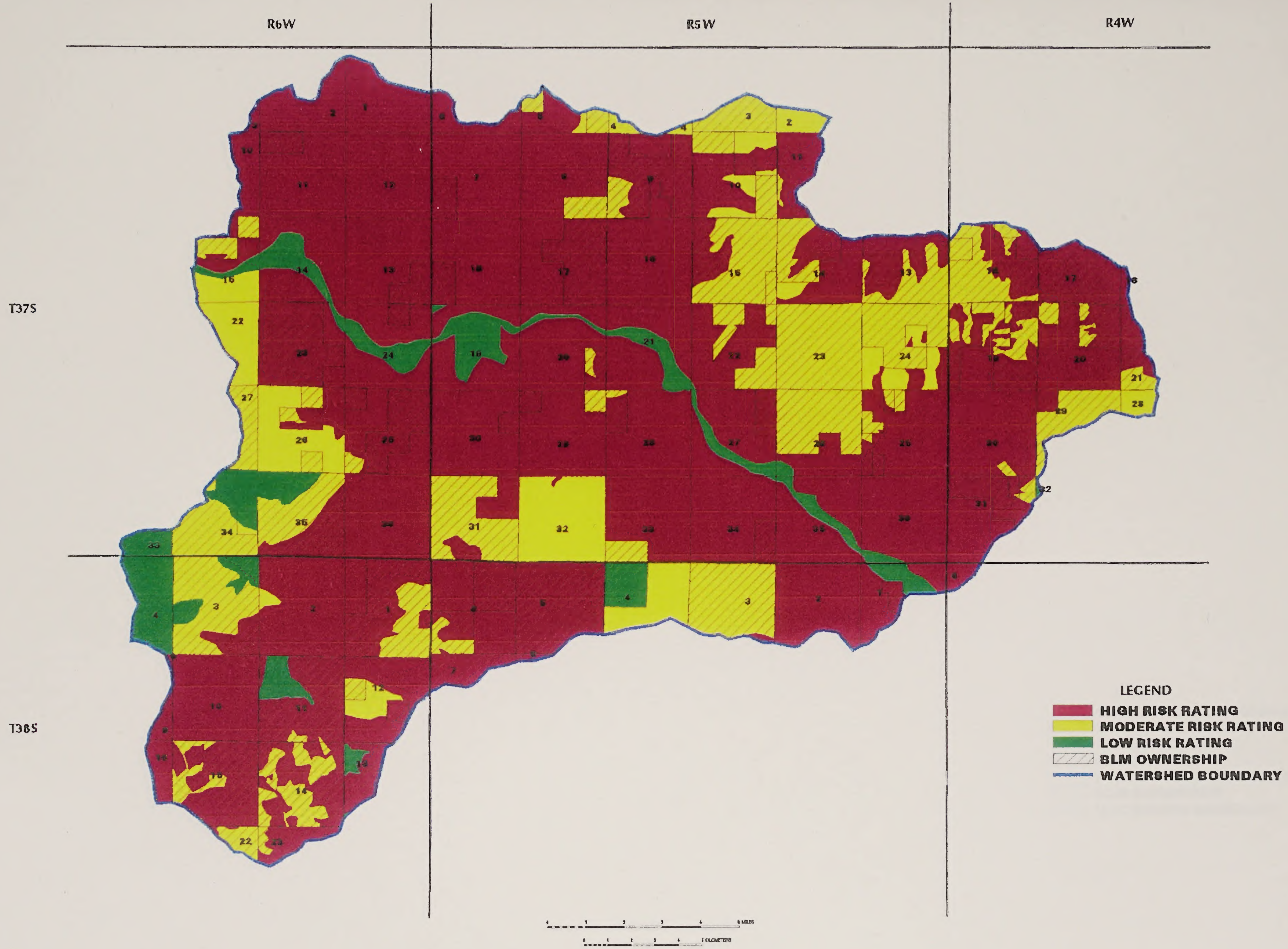
R6W
R5W
R4W
T37S
T38S
LEGEND
HIGH RISK RATING
MODERATE RISK RATING
LOW RISK RATING
BLM OWNERSHIP
WATERSHED BOUNDARY
SCALE 1:100000

Map 13

FIRE RISK RATING in the
MURPHY WATERSHED

July 25, 1997
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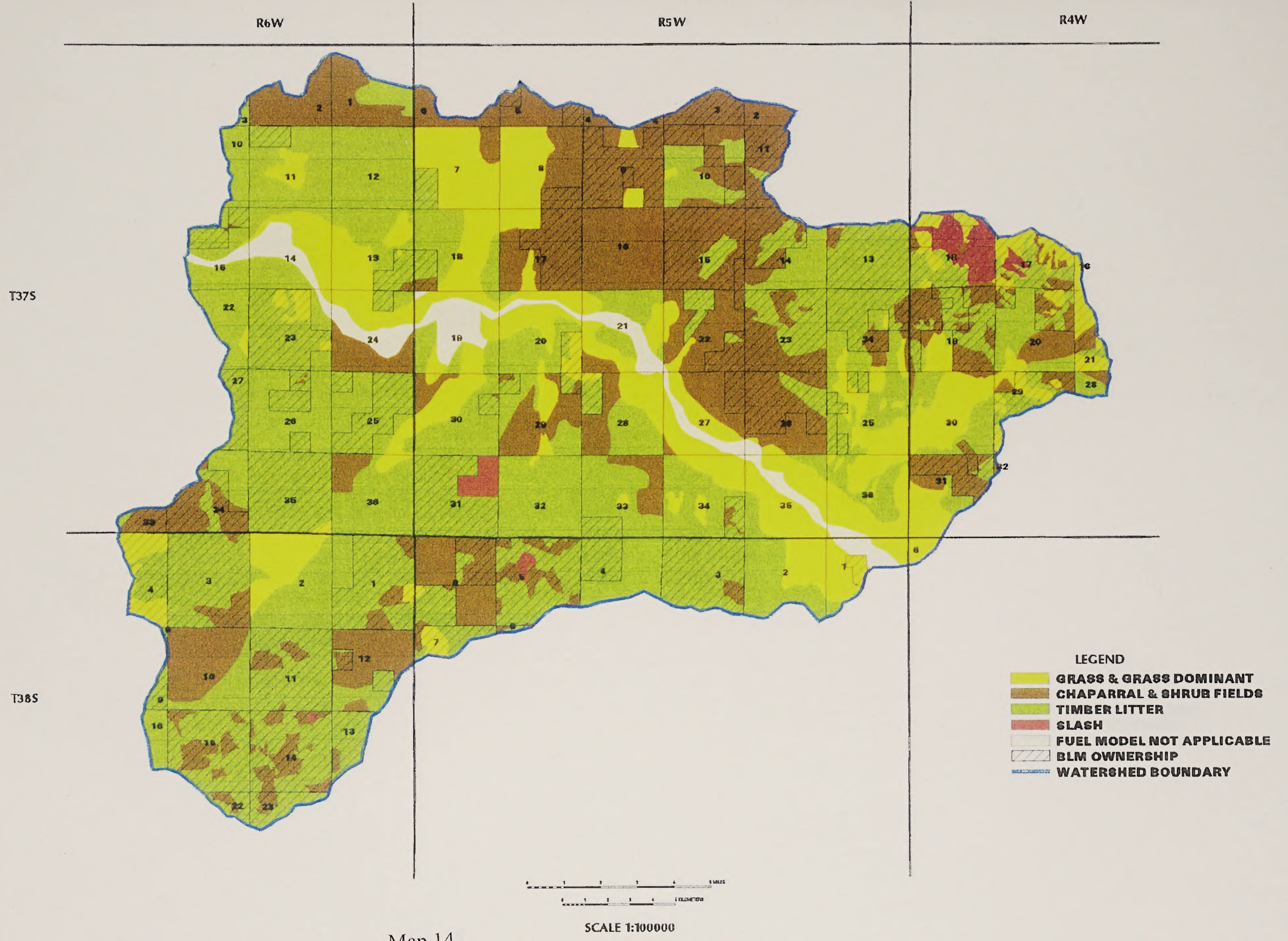
of Land Management as to the accuracy, reliability,
or completeness of these data for individual use
or aggregate use with other data


R6W
R5W
R4W
T37S
T38S
LEGEND
🟨 GRASS & GRASS DOMINANT
🟫 CHAPARRAL & SHRUB FIELDS
🟩 TIMBER LITTER
🟥 SLASH
⬜ FUEL MODEL NOT APPLICABLE
▨ BLM OWNERSHIP
WATERSHED BOUNDARY
SCALE 1:100000

Map 14

FIRE FUEL MODELS IN THE MURPHY WATERSHED

Note. No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data

July 25, 1997
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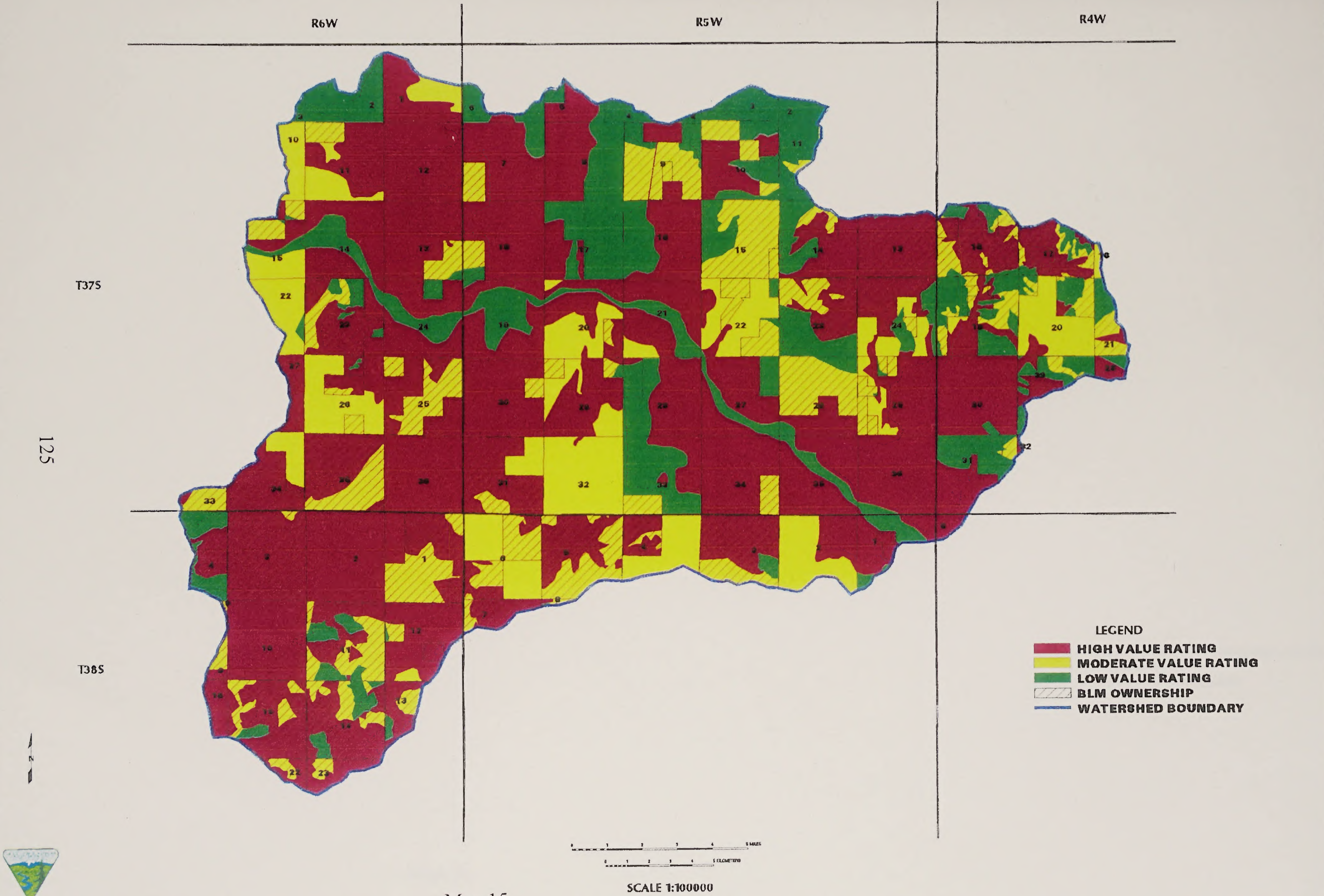
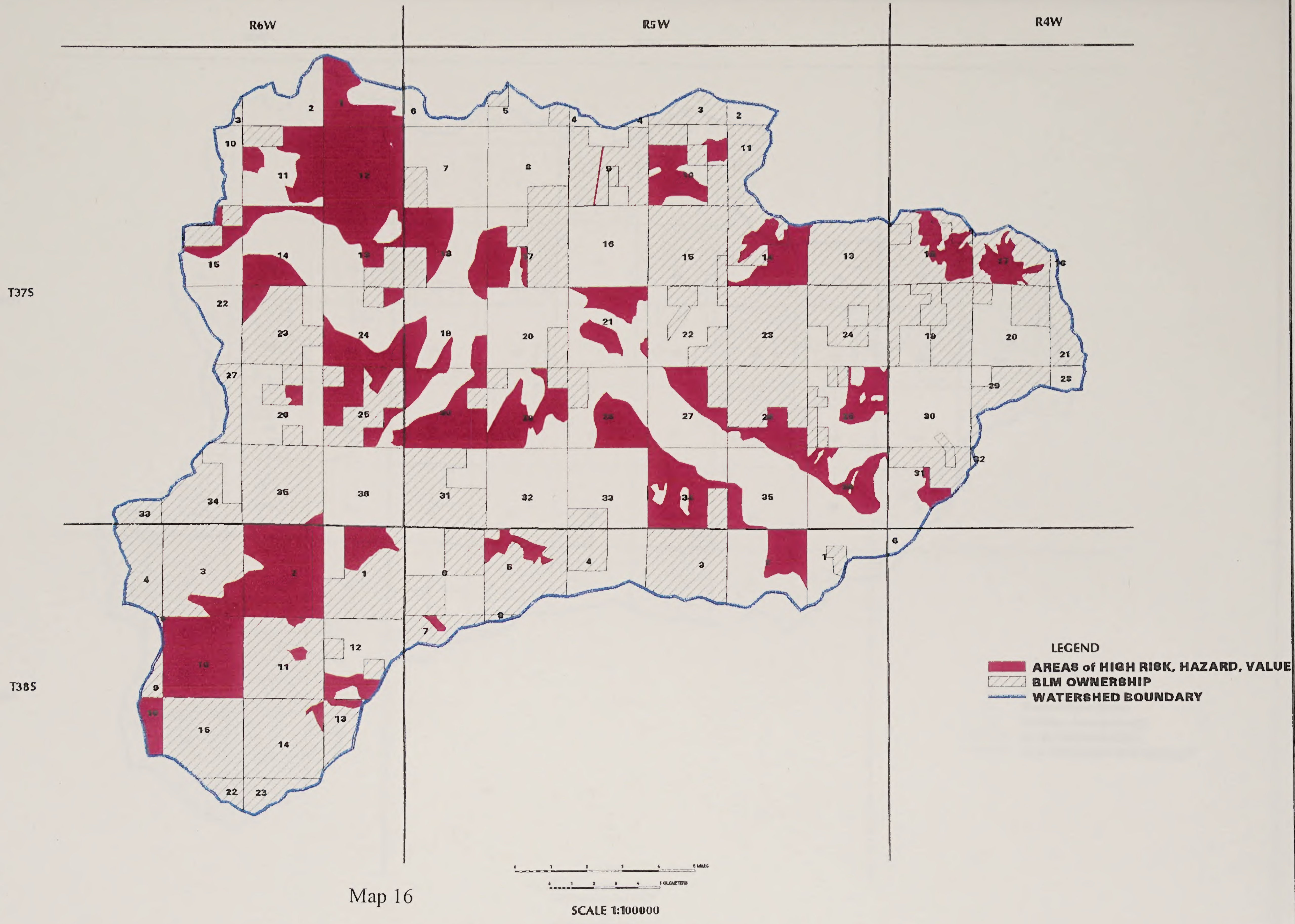

R6W
R5W
R4W
T37S
T38S
LEGEND
🟥 HIGH VALUE RATING
🟨 MODERATE VALUE RATING
🟩 LOW VALUE RATING
▨ BLM OWNERSHIP
WATERSHED BOUNDARY
SCALE 1:100000

Map 15

FIRE VALUE RATING in the MURPHY WATERSHED

Note: No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data

July 25, 1997
Dennis Glover


R6W
R5W
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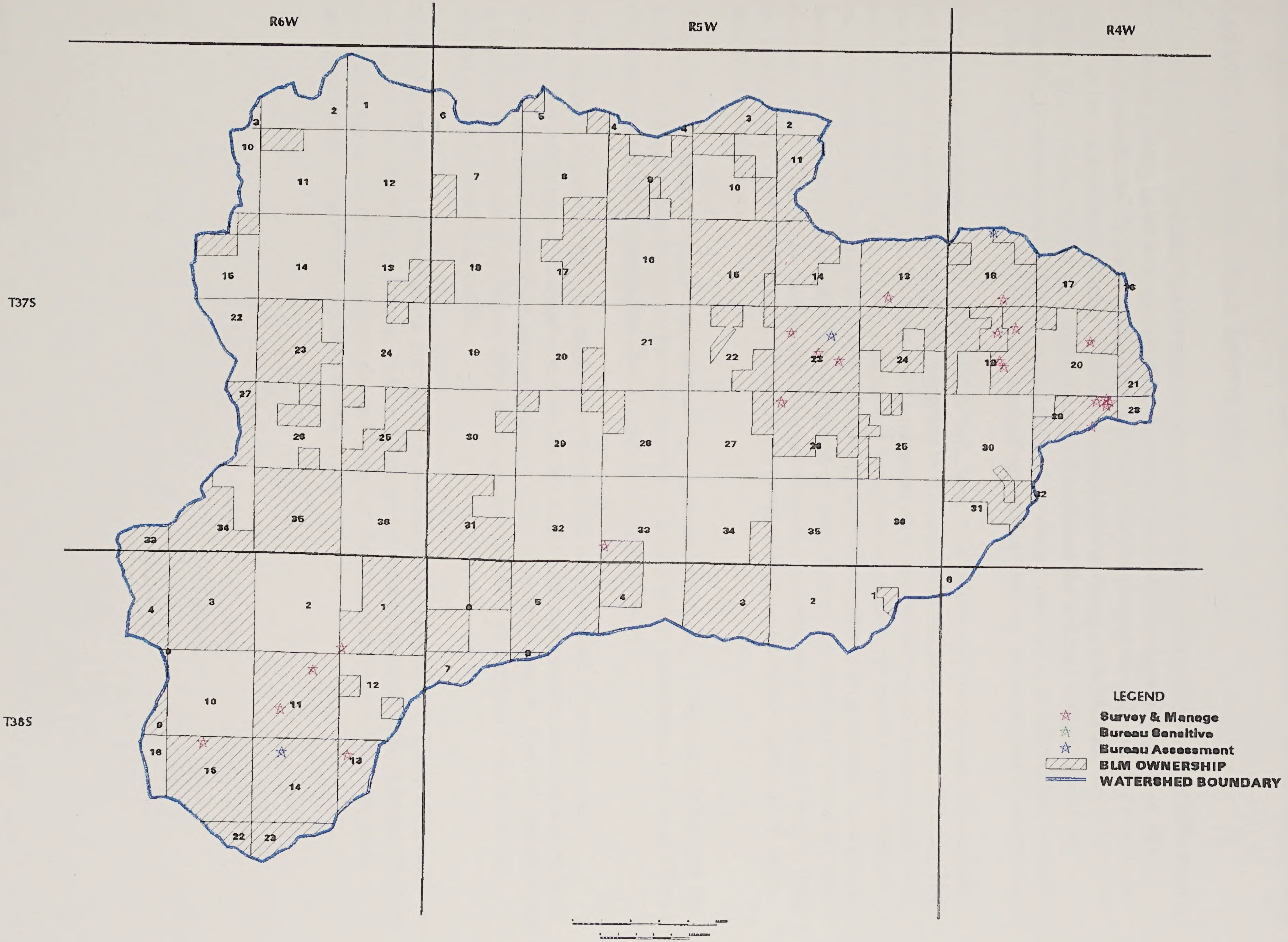
T37S
T38S
N
LEGEND
🟥 AREAS of HIGH RISK, HAZARD, VALUE
▨ BLM OWNERSHIP
WATERSHED BOUNDARY
SCALE 1:100000

Map 16

AREAS of HIGH HAZARD, RISK and VALUE-AT-RISK RATINGS in the MURPHY WATERSHED

July 25, 1997
Dennis Glover

Note: No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data


R6W
R5W
R4W
T37S
T38S
LEGEND
☆ Survey & Manage
☆ Bureau Sensitive
☆ Bureau Assessment
▨ BLM OWNERSHIP
WATERSHED BOUNDARY
N

SCALE 1:100000

Map 17

TEP SITES
IN THE MURPHY WATERSHED

02/08/99
Dennis Glover

Note: No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Appendix B: Mining Claim Information

A mining claimant / operator has the right to prospect and develop the mining claim as authorized by the General Mining Laws and amendments. Acceptable activities that normally occur on mining claims include the development of the mineral resources by extracting the gold-bearing gravels, or ore, from the claim, manufacturing of the mineral materials utilizing a trommel and sluice box system, or a millsite of some sort. After the gold is extracted the tailings (waste material) are stockpiled to either be utilized in the reclamation of the site or removed to an appropriate location. Timber on site may be used in some situations if outlined in a mining notice or plan of operations.

The operator, or claimant, will be allowed to build structures and occupy the site where such uses are incidental to mining and approved in writing by the appropriate BLM Authorized Officer. The use and occupancy of a mining claim will be reviewed on a case-by-case basis to determine if such uses are incidental. A letter of concurrence will be issued only where the operator shows that the use or occupancy is incidental to mining and that substantially regular mining activity is occurring. Issuance be subject to the operator complying with all state, federal, and local governmental codes and regulations. This means that in addition to meeting the requirements to mine on a regular basis the claimant will need to meet the standards of the Oregon Uniform Building Codes and all state sanitation requirements.

The filing of mining claims gives the claimant the rights and ownership of the minerals beneath the surface of the lands encumbered by the mining claims. In most cases, management of the surface of the claims rests with the appropriate federal agency having jurisdiction.

The claimants / operators have the right to use that portion of the surface necessary to the development of the claim. In cases where the surface of the claims are administered by the BLM or U.S. Forest Service the claimant / operator may, for safety or security reasons, limit the public access at the location of operations. Where there are no safety or security concerns, the surface of the mining claims is open to the public.

In some instances the surface of the mining claim is managed by the claimant. These are usually claims that were filed before August, 1955 and determined valid at that time. The claimants in these cases have the same rights as outlined above. However, they have the right to eliminate public access across that area where they have surface rights.

Appendix C: Road Information

1. Definitions

BLM Capitalized Roads: The BLM analyzes Bureau-controlled roads to determine capitalized or noncapitalized classification. During this analysis, the BLM considers many elements including the present and future access needs, type of road, total investment, and the road location. Each capitalized road is identified with a BLM road number and a capitalized value. BLM capitalized roads are managed and controlled by the BLM.

BLM Noncapitalized Roads and Skid Trails: BLM noncapitalized roads and skid trails are not assigned a capitalized value. Noncapitalized roads are generally jeep roads and spur roads that exist due to intermittent public and administrative use. Skid trails are ground disturbances, created under a timber sale, that have not been restored to their natural condition.

Non-BLM Roads and Skid Trails: Non-BLM roads and skid trails are administered by private land owners or other governmental agencies. The BLM has no control over these roads.

Quarries: Quarries are areas of land suitable for use as a rock source to develop aggregate material for the surfacing of roads, rip rap for slope protection, rock for stream enhancement projects, and for other miscellaneous uses. Examples of data elements for quarries: active quarry, depleted quarry.

Road Data Elements: Information on data elements is available through the Medford District road record files, right-of-way (R/W) agreement files, easement files, computer road inventory program, GIS maps, transportation maps, aerial photos, and employee knowledge of existing road systems. When data gaps are determined to exist, field data will be gathered to eliminate the gaps and at the same time existing data element information will be verified. Some information on private roads does exist, but the majority will need to be researched by the BLM through privately-authorized field investigations and answers to BLM's request for information from private land owners. Examples of data elements for roads: road density, road surface, surface depth, road use, road drainage, road condition, road grade, gates, R/W agreements, easements, maintenance levels, and barricades.

2. Definition of Columns in Watershed Road Information Tables

T-R-Sec-Seg: T = Township R = Range Sec = Section Seg = Road Segment

These columns describe the road number, location of the beginning point of the road, and the road segment. Example of a road number: 35-7-24 A.

Name:	Name of the road.
O&C:	Length of road in miles that crosses O&C lands.
PD:	Length of road in miles that crosses public domain lands.

Other: Length of road in miles that crosses other lands.

Total Miles: Total length of the road in miles.

Srf. Type: Road surface type. NAT- Natural, PRR- Pit Run, GRR- Grid Rolled, ABC- Aggregate Base Course, ASC- Aggregate Surface Course, BST- Bituminous Surface Treatment.

Sub. Wid: Subgrade width of the road in feet.

Srf. Dp: Road surfacing depth in inches.

Who Ctrls: Who controls the road: BLM = Bureau of Land Management, PVT = Private.

Cus. Mtn: BLM Custodial Maintenance Level. Level of maintenance needed during normal administrative use with no timber haul.

Opr. Mtn: BLM Operational Maintenance Level. Level of maintenance needed during active timber hauling.

BLM Maintenance Levels (Under Column for Cus. Mtn. and Opr. Mtn)

Level 1: This level is the minimal custodial care as required to protect the road investment, adjacent lands, and resource values. Normally, these roads are blocked and not open for traffic or are open only to restricted traffic. Traffic would be limited to use to high-clearance vehicles. Passenger car traffic is not a consideration. Culverts, waterbars / dips and other drainage facilities are to be inspected on a three-year cycle and maintained as needed. Grading, brushing, or slide removal is not performed unless they affect roadbed drainage. Closure and traffic restrictive devices are maintained.

Level 2: This level is used on roads where management requires the road to be opened seasonally or for limited passage of traffic. Traffic is generally administrative with some moderate seasonal use. Typically these roads are passable by high-clearance vehicles. Passenger cars are not recommended (user comfort and convenience and are not considered priorities). Culverts, waterbars / dips and other drainage facilities are to be inspected annually and maintained as needed. Grading is conducted as necessary only to correct drainage problems. Brushing is conducted as needed (generally on a three-year cycle) only to facilitate passage of maintenance equipment. Slides may be left in place provided that they do not affect drainage and there is at least 10 feet of usable roadway.

Level 3: This level is used on intermediate or constant service roads where traffic volume is significantly heavier approaching a daily average of 15 vehicles. Typically, these roads are native or aggregate surfaced, but may include low use bituminous surfaced road. This level would be the typical level for log hauling. Passenger cars are capable of using most of these roads by traveling slow and avoiding obstacles that have fallen within the travelway. Culverts, waterbars / dips and other drainage facilities are to be inspected annually and maintained as needed. Grading is conducted annually to provide a reasonable level of riding comfort. Brushing is conducted annually or as needed to provide concern for driver safety. Slides affecting drainage would receive high priority for removal, otherwise would will be removed on a scheduled basis.

Level 4: This level is used on roads where management requires the road to be opened all year and has a moderate concern for driver safety and convenience. Traffic volume is approximately a daily average of 15 vehicles and will accommodate passenger vehicles at moderate travel speeds. Typically, these roads are single lane and bituminous surfaced, but may also include heavily-used aggregate surfaced roads as well. The entire roadway is maintained on an annual basis, although a preventative maintenance program may be established. Problems are repaired as soon as discovered.

Level 5: This level is used on roads where management requires the road to be opened all year and has a high concern for driver safety and convenience. Traffic volume exceeds a daily average of 15. Typically, these roads are double or single lane bituminous, but may also include heavily used aggregate surfaced roads as well. The entire roadway is maintained on an annual basis and a preventative maintenance program is also established. Brushing may be conducted twice a year as necessary. Problems are repaired as soon as discovered.

Who Mtn:	This column changes based on who's responsible for maintaining the road. BLM- Bureau of Land Management, PVT- Private, TSO- Timber Sale Operator, or Other.
Comments:	Comments pertaining to each road.

Table C - 1: Murphy Watershed Road Information

T.	R.	Sec.	Seg.	Name	O&C	PD	Other	Total Miles	Srf. Type	Sub. Wid. (ft.)	Srf. Dp. (in.)	Who Ctrls.	Cus. Mtn.	Opr. Mtn.	Who Mtn.	Comments
37 S	05 W	09.00		Luther Divide Jeep	.30	0	0	.30	NAT	14		BLM	2	3	Other	
37 S	05 W	09.01		(No Name)	.30	0	0	.30	NAT	14		BLM	2	3	Other	
37 S	05 W	09.02		Shanty Creek	.44	0	0	.44	NAT	14		BLM	2	3	Other	
37 S	05 W	14.00	A	Oscar Creek	0	.44	0	.44	PRR	14	6	BLM	2	3	BLM	M0660 Agreement
37 S	05 W	14.00	B	Oscar Creek	0	0	.55	.55	PRR	14	6	BLM	2	3	BLM	M0660 Agreement
37 S	05 W	14.00	C	Oscar Creek	1.11	0	0	1.11	PRR	14	6	BLM	2	3	BLM	
37 S	05 W	14.01	A	Savage Creek West	.59	.11	0	.70	NAT	14		BLM	2	3	BLM	
37 S	05 W	14.01	B	Savage Creek West	.49	0	0	.49	NAT	14		BLM	2	3	BLM	
37 S	05 W	14.02		Savage Pass B Spur	0	.24	0	.24	NAT	14		BLM	2	3	BLM	
37 S	05 W	23.00		Oscar Creek Spur	.40	0	0	.40	NAT	14		BLM	2	3	BLM	
37 S	06 W	14.00	A	Round Top	0	0	.58	.58	NAT	14		BLM	1	1	Other	
37 S	06 W	14.00	B	Round Top	0	0	.28	.28	NAT	14		BLM	1	1	BLM	
37 S	06 W	22.00		(No Name)	.40	0	2.00	.40	NAT	14		PVT	2	2	Other	(Not on BLM inventory)
37 S	06 W	36.00	A	Spencer Creek	.89	0	.27	1.16	ASC	14	8	BLM	4	4	BLM	
37 S	06 W	36.00	B	Spencer Creek	.42	0	0	.42	ASC	14	8	BLM	4	4	BLM	
37 S	06 W	36.00	C	Spencer Creek	0	0	.40	.40	ASC	14	8	BLM	4	4	Other	M1182 Agreement
37 S	06 W	36.00	D	Spencer Creek	1.07	0	0	1.07	ASC	14	8	BLM	4	4	BLM	
37 S	06 W	36.00	E1	Spencer Creek	.80	0	0	.80	ASC	14	8	BLM	4	4	BLM	
37 S	06 W	36.00	E2	Spencer Creek	.25	0	0	.25	ASC	14	8	BLM	4	4	BLM	
38 S	05 W	3.00		Pennington Mtn	1.40	0	0	1.40	NAT	14		BLM	2	2	BLM	

Table C - 1: Murphy Watershed Road Information

T.	R.	Sec.	Seg.	Name	O&C	PD	Other	Total Miles	Srf. Type	Sub. Wid. (ft.)	Srf. Dp. (in.)	Who Ctrls.	Cus. Mtn.	Opr. Mtn.	Who Mtn.	Comments
38 S	05 W	3.03		Pennington Mtn D	.20	0	0	.20	NAT	14		BLM	2	2	BLM	
38 S	05 W	3.04		Pennington Mtn E	.10	0	0	.10	NAT	14		BLM	2	2	BLM	
38 S	05 W	3.05		Pennington Mtn Sp	.63	0	0	.63	NAT	14		BLM	2	2	BLM	
38 S	05 W	5.00		Grays Creek	.28	.08	0	.36	NAT	14		BLM	2	2	BLM	
38 S	05 W	5.01		Grays Creek Sp A	.81	0	0	.81	NAT	14		BLM	2	2	BLM	
38 S	05 W	5.02		Grays Creek Sp B	1.90	0	.04	1.94	NAT	14		BLM	2	2	BLM	
38 S	05 W	5.03		Grays Creek Sp	.20	0	0	.20	NAT	14		BLM	2	2	BLM	
38 S	05 W	6.00	A	Cherry Flat	0	.06	0	.06	NAT	14		BLM	3	3	BLM	
38 S	05 W	6.00	B	Cherry Flat	0	0	.09	.09	NAT	14		PVT	3	3	Other	M0660 Agreement
38 S	05 W	6.00	C	Cherry Flat	.42	.89	0	1.31	NAT	14		BLM	2	2	BLM	
38 S	05 W	6.01		Cherry Flat Sp	1.82	.14	.07	2.03	NAT	14		BLM	2	2	BLM	
38 S	05 W	6.02		Cherry Flat Sp	0	.59	.11	.70	NAT	14		BLM	2	2	BLM	
38 S	05 W	6.03		Cherry Flat Sp	.14	.09	.06	.29	NAT	14		BLM	2	2	BLM	M0660-049 Agreement
38 S	06 W	1.00	A	Cherry Flat Main	1.25	0	0	1.25	ASC	14	8	BLM	3	3	BLM	
38 S	06 W	1.00	B	Cherry Flat Main	.52	0	0	.52	ASC	14	8	BLM	3	3	BLM	
38 S	06 W	1.00	C	Cherry Flat Main	.42	.68	0	1.10	ASC	14	8	BLM	3	3	BLM	
38 S	06 W	1.00	D	Cherry Flat Main	2.23	.56	.43	3.22	PRR	14	6	BLM	3	3	BLM	
38 S	06 W	1.01		Jeep Road	.91	0	.76	1.67	NAT	14		BLM	1	1	Other	
38 S	06 W	1.02		Cherry Flat Sp	.43	0	0	.43	NAT	14		BLM	2	2	BLM	
38 S	06 W	11.00		Murphy Mountain	5.67		.09	5.67	ABC	14	6	BLM	3	3	BLM	
38 S	06 W	11.01		Murphy Mtn A	1.07	0	0	1.07	NAT	14		BLM	1	2	BLM	

Table C - 1: Murphy Watershed Road Information

T.	R.	Sec.	Seg.	Name	O&C	PD	Other	Total Miles	Srf. Type	Sub. Wid. (ft.)	Srf. Dp. (in.)	Who Ctrls.	Cus. Mtn.	Opr. Mtn.	Who Mtn.	Comments
38 S	06 W	13.00	A	Wallow Crk Sp	.66	0	0	.66	ASC	14	6	BLM	3	3	BLM	
38 S	06 W	13.01		Chrome Ridge Jeep	.38	0	0	.38	ASC	14	6	BLM	3	3	BLM	
38 S	06 W	13.02		Mungers Ridge Sp	.75	0	0	.75	ASC	14	6	BLM	3	3	TSO	
38 S	06 W	13.04		Spencer Crk A Sp	.93	0	0	.93	ASC	17	6	BLM	3	3	TSO	
38 S	06 W	14.00	A	Spencer Crk B Rd	1.70	0	0	1.70	ASC	14	6	BLM	3	3	BLM	
38 S	06 W	14.00	B	Spencer Crk B Rd	.49	0	0	.49	ASC	14	6	BLM	3	3	BLM	
38 S	06 W	14.00	C	Spencer Crk B Rd	.27	0	0	.27	ASC	14	6	BLM	3	3	BLM	
38 S	06 W	14.01		Spencer Crk B Sp	.69	0	0	.69	ASC	14	6	BLM	3	3	BLM	
38 S	06 W	14.02		Murphy Mtn Sp	.14	0	0	.14	NAT	14		BLM	1	1	BLM	
38 S	06 W	14.03		Spencer Crk B Sp	.17	0	0	.17	NAT	14		BLM	2	2	BLM	
38 S	06 W	15.00		Murphy Mtn C Sp	.88	0	0	.88	NAT	17		BLM	1	1	BLM	
38 S	06 W	15.01	A	Murphy Mtn B Sp	.65	0	0	.65	ABC	14	6	BLM	3	3	BLM	
38 S	06 W	15.01	B	Murphy Mtn B Sp	.40	0	0	.40	PRR	14	6	BLM	3	3	BLM	
38 S	06 W	15.01	C	Murphy Mtn B Sp	.80	0	0	.80	NAT	16		BLM	2	2	BLM	
38 S	06 W	15.02		Murphy Mtn Jeep	1.85	0	0	1.85	GRR	16	6	BLM	2	3	TSO	

Appendix D: Wildlife Information

Table D - 1: Suitable Habitat Available for Northern Spotted Owls Sites in the Murphy Watershed

Site Name	MSNO	Bureau-Administered Habitat within 1.3 miles (Acres)	Percent Suitable Habitat within 1.3 miles
Caris Creek	4480	370	10.9%
Case Creek	2257	358	10.5%
Dales Bluff	4481	1,022	30.2%
Grays Ridge	0101	1,533	45%
Iron Creek	2067	1,153	34%
Iron Eagle	3556	942	27.8%
Millers Island	3929	1,226	36%
Murphy Creek	2282	644	19%
Pennington Creek	2633	1,307	38.6%
Shilohs Rock Mine	3933	482	14.2%

McKelvey rating system: Spotted owl habitat managed by the Bureau of Land Management has been analyzed using the McKelvey rating system. The McKelvey rating system is based on a model that predicts spotted owl populations based on habitat availability. Stands are examined for factors such as canopy layering, canopy closure, snags, woody material and other features. The biological potential of a stand to acquire desired conditions is also taken in consideration. During the winter and spring of 1996, stands were visually inspected and rated into the six habitat categories. This rating system has some serious short-comings and does not reflect the actual amount of habitat. Factors not considered are connectivity and fragmentation. For instance, a single acre of optimal habitat surrounded by clear cuts is as valuable in this rating system as an acre of optimal habitat connected to hundreds of other similar acres. Despite the short-comings, this system reflects the best available data at this time.

Special Status Species

Special status species are species that are recognized by the Federal or state government as needing particular consideration in the planning process, due to low populations (due to natural and human causes), restricted range, threats to habitat and for a variety of other reasons. This list includes species officially listed and proposed for listing. State listed species are those species identified as threatened, endangered, or pursuant to ORS 496.004, ORS 498.026 or ORS 546.040. Also included are Bureau Assessment species which are plants and animals specie that are found on List 2 of the Oregon Natural Heritage Data Base and those species on the Oregon List of Sensitive Wildlife Species (ORS 635-100-

040) and identified in BLM Instruction Memo No. OR-91-57. Bureau Sensitive species are those species eligible to be federally listed, state listed, on List 1 in the Oregon Natural Heritage Data Base, or approved by the BLM state director.

Table D - 2: Special Status Species Habitat Needs

SPECIES (COMMON NAME)	HABITAT ASSOCIATION	SPECIAL HABITAT FEATURE	CONCERN
Grey Wolf	Generalists	Large Blocks of Unroaded Habitat	Extirpated
White-footed Vole	Riparian	Alder/mature Riparian	Naturally Rare, Modification/loss of Habitat from Development
Red Tree Vole	Mature/old Growth Conifer	Mature Douglas-fir Trees	Declining Habitat Quality/quantity from Logging
California Red Tree Vole	Mature/old Growth Conifer	Mature Douglas-fir Trees	Declining Habitat Quality/quantity from Logging
Fisher	Mature/old Growth Riparian	Down Wood/snags	Declining Habitat Quality/quantity & Fragmentation from Logging
California Wolverine	Generalists	Large Blocks of Unroaded Habitat	Declining Habitat Quality/quantity & Fragmentation from Logging and Road Building, Human Disturbance
American Martin	Mature/old Growth	Down Wood, Living Ground Cover	Declining Habitat Quality/quantity & Fragmentation
Ringtail	Generalists	Rocky Terrain, Caves, Mine Adits	Northern Limit of Range
Townsend's Big-eared Bat	Generalists	Mine Adits, Caves	Disturbance to Nurseries, Hibernacula & Roosts, Closing Mine Adits
Fringed Myotis	Generalists	Rock Crevices & Snags	Disturbance to Roosts and Colonies
Yuma Myotis	Generalists	Large Live Trees with Crevices in the Bark &	Limited Mature Tree Recruitment
Long-eared Myotis	Generalists	Large Live Trees with Crevices in the Bark	Limited Mature Tree Recruitment
Long-legged Myotis	Generalists	Large Live Trees with Crevices in the Bark	Limited Mature Tree Recruitment
Pacific Pallid Bat	Generalists	Snags, Rock Crevices	General Rarity/disturbance/snag Loss
Peregrine Falcon	Generalists	Cliff Faces	Low Numbers, Prey Species Contaminated with Pesticides
Bald Eagle	Lacustrine/rivers	Large Mature Trees with Large Limbs near Water	Populations Increasing
Northern Spotted Owl	Mature/old Growth	Late-successional Mature Forest with Structure	Declining Habitat Quality/quantity & Fragmentation
Marbled Murrelet	Mature/old Growth	Large Limbed Trees, high Canopy Closure	Declining Habitat Quality/quantity
Northern Goshawk	Mature/old Growth	High Canopy Closure Forest for Nest Sites	Declining Habitat Quality/quantity & Fragmentation, Human Disturbance
Mountain Quail	Generalists		No Concern in the watershed
Pileated Woodpecker	Large Trees	Large Diameter Snags	Snag and down Log Removal from Logging, salvage & Site Prep
Lewis' Woodpecker	Pine/oak Woodlands	Large Oaks, pines & Cottonwoods Adjacent to Openings	Declining Habitat Quality/quantity Fire Suppression, rural & Agriculture Development, Riparian Modification
White-headed Woodpecker	Pine/fir Mountain Forests	Large Pines Living and Dead	Limited Natural Populations, logging of Large Pines and Snags
Flammulated Owl	Pine/oak Woodlands	Pine Stands & Snags	Conversion of Mixed-aged Forest to Even-aged Forests
Purple Martin	Generalists	Snags in Burns with Excavated Cavities	Salvage Logging after Fire and Fire Suppression
Great Grey Owl	Pine/oak/ True Fir/ Mixed Conifer	Mature Forest with Adjoining Meadows	Declining Quality/quantity of Nesting and Roosting Habitat
Western Bluebird	Meadows/ Open Areas	Snags in Open Areas	Snag Loss/fire Suppression Competition with Starlings for Nest Sites
Acorn Woodpecker	Oak Woodlands	Large Oaks	Declining Habitat Quality/quantity

Table D - 2: Special Status Species Habitat Needs

SPECIES (COMMON NAME)	HABITAT ASSOCIATION	SPECIAL HABITAT FEATURE	CONCERN
Tricolored Blackbird	Riparian	Wetlands, Cattail Marshes	Limited & Dispersed Populations, Habitat Loss from Development
Pygmy Nuthatch	Pine Forests	Large Dead & Decaying Pine	Timber Harvest of Mature Trees, Salvage Logging
Black-backed Woodpecker	Pine	Snags and Pine	Removal of Mature Insect Infested Trees
Williamsons Sapsucker	Montane Conifer Forest	Trees with Advanced Wood Decay	Removal of Heart Rot Trees, snag Removal, conversion to Managed Stands
Northern Pygmy Owl	Mixed Conifer/	Snags	Snag Removal, Depend on Woodpecker Species to Excavate Nest Cavities
Grasshopper Sparrow	Open Savannah	Grasslands with Limited Shrubs	Limited Habitat, Fire Suppression, Conversion to Agriculture
Bank Swallow	Riparian	Sand Banks near Open Ground or Water	General Rarity, Declining Habitat Quality
Western Pond Turtle	Riparian/uplands	Marshes, Sloughs Ponds	Alteration of Aquatic and Terrestrial Nesting Habitat, exotic Species Introduction
Del Norte Salamander	Mature/old Growth	Talus	Declining Habitat Quality/quantity & Fragmentation
Siskiyou Mtn. Salamander	Closed Canopy Forest	Talus	Declining Habitat Quality/quantity & Fragmentation
Foothills Yellow-legged Frog	Riparian	Permanent Streams with Gravel Bottoms	Water Diversions, Impoundments, General Declines in Genus Numbers
Red-legged Frog	Riparian	Marshes, ponds & Streams with Limited Flow	Exotic Species Introduction Loss of Habitat from Development
Tailed Frog	Riparian	Cold Fast Flowing Streams in Wooded Area	Sedimentation and Removal of Riparian Vegetation Due to Logging, Grazing & Road Building
Clouded Salamander	Mature	Snags & down Logs	Loss of Large Decaying Wood Due to Timber Harvest and Habitat Fragmentation
Variegated Salamander	Riparian	Cold, Clear Seeps & Springs	Water Diversions & Sedimentation from Roads & Logging
Black Salamander	Generalists	Down Logs, Talus	Limited Range, Lack of Data
Sharptail Snake	Valley Bottoms Low Elevation	Moist Rotting Logs	Low-Elevation Agricultural and Development Projects That Remove/limit down Wood
California Mountain Kingsnake	Habitat Generalists	Habitat Generalists	Edge of Range, General Rarity, Collectors
Common Kingsnake	Habitat Generalists	Habitat Generalists	Edge of Range, General Rarity, Collectors
Northern Sagebrush Lizard	Open Brush Stands	Open Forests or Brush with Open Understory	Edge of Range, Fire Suppression

Other Species and Habitats

Cavity-dependent species and species utilizing down logs are of special concern in the watershed. Historically, snags were produced by various processes including drought, wind-throw, fires, and insects. The number of snags fluctuated through time in response to these events. This natural process has largely been interrupted by demands for timber harvest. The potential recovery of snag-dependent sensitive species such as the Pileated woodpecker will depend on the ability of the Federal agencies to manage this resource. Silvicultural practices have historically focused on even-aged stands and have resulted in deficits of snags and down logs in harvested areas. Other activities that have depleted snags and down logs are site preparation for tree planting (particularly broadcast burning), fuelwood cutting, post-fire salvage, and previous entries for mortality salvage. Managed stands that currently contain 10-12 (5 MBF) overstory trees per acres or less are also of concern from a wildlife tree/down log perspective. Stands with remaining overstory trees have the potential to provide for current and future snag/down log requirements throughout the next rotation.

Snags and down logs provide essential nesting/denning, roosting, foraging, and hiding cover for at least 100 species of wildlife in western Oregon (Brown 1985). For some species, the presence or absence of suitable snags will determine the existence or localized extinction of that species. In forested stands, cavity nesting birds may account for 30-40% of the total bird population (Raphael and White 1984). The absence of suitable snags (snags decay stage, number and distribution) can be a major limiting factor for these snag-dependent species.

The hardness (decay stage) of a snag is an important factor in determining its foraging, roosting and nesting use by individual species. Woodpeckers such as the pileated woodpecker (*Dryocous pileatus*) often choose hard snags (stage 1) for nesting whereas wrens and chickadees use the softer (stages 2 and 3) snags. The use of snags as a foraging substrate also changes with time and the decay stage of the snag. As a snag decomposes the insect communities found within it changes these identified are three foraging substrates provided by snags: the external surface of the bark, the cambium layer and the heartwood of the tree.

Snags are also used as food storage sites and as roosting/resting sites for many species. A variety of mammals, birds and some owls use snags to cache prey and other food items. Vacated nesting cavities are often used by wildlife for protection from inclement weather or on hot summer days. The martens (*Martes americana*) often use snags as resting and hunting sites and a single pileated woodpecker may use up to 40 different snags for roosting.

Snags continue their function as a key element of wildlife habitat when they fall to the ground as down logs. Once again, down log use by individual species is dependent on the decay stage of the log. The larger the diameter of the log and the longer its length the more functional it is for wildlife. Depending on the decay stage of the log, it will be used for lookout and feeding sites, nesting and thermal cover, for food storage or for foraging. For example, species such as the clouded salamander (*Aneides ferreus*) require the microhabitat provided by bark sloughing of the log whereas small mammals such as red-backed voles (*Clethrionomys occidentalis*) burrow inside the softer logs.

The RMP targets maintaining primary cavity nesting species at 40% of their naturally occurring population levels (biological potential). Maintaining biological potential at 40% is considered to be the minimal viable population level for any given species. By managing for primary cavity nesters at 40% biological potential we have also managed for many other snag and dependent species such as flying squirrels (*Glaucomys sabrinus*), mountain bluebirds (*Sialia currucoides*), and Vaux's swift (*Chaetura* vauxi) at an unknown level. Managing for populations at 40% biological potential does not allow for species flexibility in adapting to changing environments or to major environmental events such as wildfire or long-term climatic change. In addition, managing at 40% biological potential does not meet BLM policy guidelines for those species where we are trying to restore, maintain and enhance existing populations (Manual 6840).

Appendix E: Fire Management Planning - Hazard, Risk, and Value At Risk Rating Classification Method and Assumptions

A. HAZARD

Hazard rating is based on the summation of points assigned using the six elements as follows:

1) Slope:

Percent	Points
0-19	5
20-44	10
45+	25

2) Aspect:

Degree	Points
316-360, 0-67	5
68-134, 294-315	10
135-293	15

3) Position On Slope

	Points
Upper 1/3	5
Midslope	10
Lower 1/3	25

4) Fuel Model:

Model	Points
Grass 1, 2, 3	5
Timber 8	5
Shrub 5	10
Timber 9	15
Shrub 6	20
Timber 10	20
Slash 11	25
Shrub 4	30
Slash 12, 13	30

5) Ladder Fuel Presence:
(Use when forest vegetation has DBH of 5" or greater (vegetation condition class 6). Exceptions are possible based on stand conditions.)

	Points
Ladder fuel absent.	0
Present on less than one-third of area; vertical continuity > or < 50%.	5
Present on one-third to two-thirds of area; vertical continuity is <50%.	15
Present on one-third to two-thirds of area; vertical continuity is > 50%.	25
Present on greater than two-thirds of area; vertical continuity is <50%.	30
Present on greater than two-thirds of area; vertical continuity is > 50%.	40

6) Summary Rating:

POINTS	HAZARD RATING
0-45	LOW
50-70	MODERATE
75-135	HIGH

B. RISK

Assigned based on human presence and use, and on lightning occurrence.

High rating when human population areas are present on or within 1/4 mile of the area; area has good access with many roads; relatively higher incidence of lightning occurrence; area has high level of human use.

Moderate rating when area has human access and experiences informal use; area is used during summer and fall seasons as main travel route or for infrequent recreational activities. Lightning occurrence is typical for the area and not notably higher.

Low rating when area has limited human access and infrequent use. Baseline as standard risk, mainly from lightning occurrence with only rare risk of human caused fire.

C. VALUE AT RISK

Best assigned through interdisciplinary process. Based on human and resource values within planning areas. Can be based on land allocations, special use areas, human improvements/monetary investment, residential areas, agricultural use, structures present, soils, vegetative conditions, and habitat.

Examples:

High rating - ACEC, RNA, LSR, Special Status species present, Critical Habitats, recreation area, residential areas, farming, vegetation condition and McKelvey Ratings of 81, 82, 71, 72; vegetation condition of 4 and 5. Caves, cultural, or monetary investment present. Riparian areas.

Moderate rating - Granitic soils, informal recreation areas and trails. Vegetation and McKelvey Rating of 85, 75, 65.

Low rating - Vegetation condition class 1, 2, 3; and vegetation 5, 6, 7 with McKelvey Rating 4.